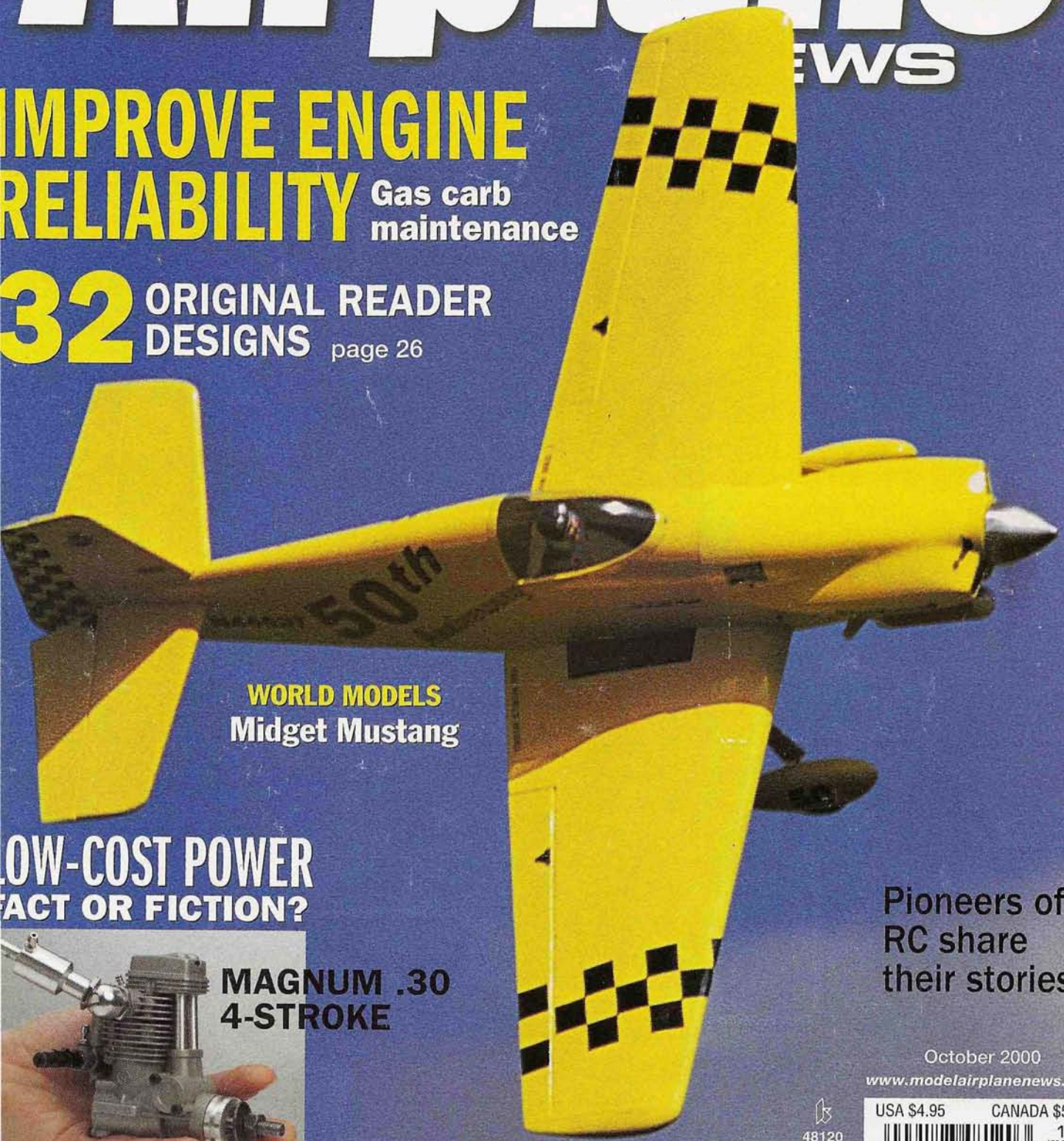
LY LIKE A PRO: GYROS FOR AIRCRAFT

MASTER THE SPIN

MODEL Airplane NEWS

IMPROVE ENGINE RELIABILITY
Gas carb maintenance

32 ORIGINAL READER DESIGNS
page 26



WORLD MODELS
Midget Mustang

LOW-COST POWER
FACT OR FICTION?

MAGNUM .30 4-STROKE

Pioneers of RC share their stories

October 2000
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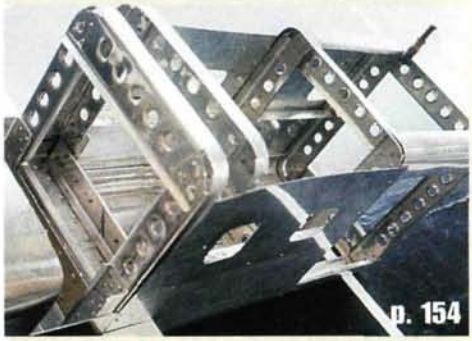
MODEL Airplane NEWS

OCTOBER 2000 • VOLUME 128, NUMBER 10

ON THE COVER: the World Models Mfg. Midget Mustang ARF, distributed by AirBorne Models, features high-quality craftsmanship and is a great performer. Inset: in this month's "Air Power," Chris Chianelli takes a close look at the new Magnum XL .30 RFS engine. This nice-running little powerplant might just be the best in its class.


p. 26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Features

Construction


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Columns

Departments

EDITORIAL

BY DEBRA SHARP

Design contest finalists

Judging by the overwhelming response to our "4th Great RC Airplane Design Contest," the craft of designing and scratch-building model aircraft continues to flourish. We received so many outstanding entries that we decided to feature 32 finalists in this issue and get *your* input before we choose the top three winners and runners-up. Made out of every conceivable construction material—foam, balsa, ply and carbon-fiber—these designs have wingspans from 36 to 145 inches and encompass detailed scale models, sport planes and even a floating cube! Please take a moment to jot down your top three picks and send us an email (man@airage.com) or a postcard (Great Design Contest, 100 East Ridge, Ridgefield, CT 06877-4606 USA). The winners will be featured in future construction articles, so this is a great way for you to let us know which types of planes you'd like to build.

It isn't easy to surprise "Mr. Scoop," Chris Chianelli, but Magnum's new .30 4-stroke did just that. Check out his findings in "Air Power" on page 76.

This month, IMAC competitor Dan Wolanski allays the fear of spinning your airplane by explaining how to recover from the maneuver easily. Whether the spin you're attempting is inverted, cross-over, flat, or knife-edge, getting *out* of a spin is more crucial than getting *into* one. On page 52, learn how to safely do both.

In his "Effective Programming" column, Don Edberg takes a close look at gyros and how to maximize their use in our models. Gyros have been around for a long time and are mainly used in helicopters, but these units have recently been used in aerobatic airplanes and scale models to help pilots fly more precisely. Though not an "autopilot" device, a gyro can make even the best pilot fly more smoothly, help to compensate for windy conditions and make take-offs and landings easier. The piezo gyros on the market today are reliable and low cost, and they're also easy to install and adjust.

Performing the spin is easier than you may think; see page 52.

Have you ever thought about how you could build a true-to-scale DC-3 or P-51 model entirely out of metal, complete with flared lightening holes and functional rivets? In this month's "Final Approach," Colombian modeler Carlos Rangel highlights his personal twist on scale model construction.

This is *your* magazine; please email us—man@airage.com—or write to us (100 East Ridge, Ridgefield, CT 06877-4606 USA) and tell us which topics and issues you'd like to see addressed in these pages. ✈

Carlos Rangel's all-aluminum Pilatus Porter.

MODEL Airplane NEWS

FOUNDED 1929

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AIRWAVES *Our readers write back*

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

FROM PLANS TO WOOD

I purchased a couple of plans not long ago, and now I need some advice. I would like to know how to go about transferring what is on the plan to the wood so I can cut out the parts. Are there any tricks of the trade? [email]

DENNIS WILES

Dennis, transferring plan drawings to wood is not that difficult. There are several ways to do it; the most popular way is to paste the drawing of the part you want onto the wood and cut it out with a band saw or jigsaw. A good way is to make copies of the various plan parts and paste these to the wood with a spray adhesive such as 3M Super 77. Use it sparingly; only a light mist is required. Don't simply cut up the plan and paste the various pieces to the wood; if you do this, you won't have the plan to use later on. With some plans, you can turn them over, place the wood under the drawing you want to transfer and then heat the paper with a hot iron. This will sometimes reactivate the ink so you end up with a reverse image on the wood. This works especially well with Xerox copies of the plans. Some modelers have good luck with carbon paper. Or you could place the wood under the part you want to transfer and use a straight pin to prick through the paper, thereby transferring the part's outline with small holes punched into the wood. Then you "connect the dots" with a pen and cut out the part. Good luck. GY

PROPPING FOR POWER

Just read "The Right Combination" in your August issue, and it brought back the anger I had when I read Dave Gierke's report on the Magnum Pro .36 a while back! Why would anyone put an 11x8 prop on a poor little .36? I have a Pro .36 and love it, but it runs best on a 9.5x6 or a 10x5. Even a 10x4 works well on fun-fly planes.

Why do you test with much bigger props than are normally used? The graph you used puts the power curve as topping out at 16,000 to 17,000rpm, yet very few of the props you tested will get up there! This is a high-compression, high-speed engine and should be propped to develop about 14,000 on the ground, which would unload to about 16,000 in the air on a normal plane.

Not everyone flies a slick pattern plane off a hard strip. A 10x8 prop on this engine would take forever to get out of the grass on takeoff, and it would put too much load on the engine and prevent it from developing any power. I love engine tests, but make them a little more practical. [email]

RON MYER

Although my review of the Magnum Pro .36 indicated that the engine had its peak bhp at about 17,000rpm, I certainly didn't advocate that the engine needed to be propped there for maximum performance with the model we were using. In fact, there are few models out there, with the exception of racing types, that would allow the "toothpick" props required to fly them. Believe it or not, 2-stroke engines don't have to be unloaded to their bhp peak to perform well with bigger, heavier, relatively high-drag models, as Andy Lennon's article vividly points out! In fact, the trend is definitely toward propping our sport-type models to the torque peak, *which just happens to be at about 9,500rpm for the .36. Although the APC 11x8 wasn't my first choice for the test model, the .36 still turned it a respectable 9,400rpm (better than a bunch of 4-strokes in that displacement range that I have seen).*

Anyway, my telemetry system indicated that the best combination for the engine and test airframe was the APC 9.5x8 turning 13,500rpm on the ground and 13,750 in the air—straight and level. By the way, propeller unload numbers that have been quoted (guessed at) by many in the past are generally way too high, as can be seen from the above example. Of course, this depends somewhat on a number of variables, such as airframe drag, propeller planform, engine design and other relatively minor things.

By the way, my 5-pound test model virtually jumped off the ground with 4.7 pounds of static thrust from the above-mentioned combination, from a grass strip. Try to remember that power isn't the only game in town; in fact, it's in the minority, especially when you consider what happens to propeller noise *at elevated rpm; do you fly at a noise-regulated club field?* Dave Gierke

New products or people behind the scenes: my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you the reader who matters most! I spy for those who fly!

AIR SCOOP

BY CHRIS CHIANELLI

America the Beautiful

Thanks to AirBorne Models, a P-51 Miss America is available decked out in red, white and blue with installed retracts. Like others in the line, Miss America is of all-balsa-and-plywood construction, sanded and covered with high-quality, iron-on film. The kit includes all hardware and accessories and AirBorne's unique, clear "working" cowl, so you won't mess up the beautifully painted fiberglass cowl during the assembly process. Specs: wingspan—57.5 inches; wing area—58.5 square inches; flying weight—6 pounds; length—49.5 inches; radio required—5-channel with 6 servos; engine requirements—2-stroke .46 or 4-stroke .70.

AirBorne Models LLC, 2127-H S. Vasco Rd., Livermore, CA 94550; (925) 371-0922; fax (925) 371-0923.

9ZA World Championship II Series

Futaba's new 9ZA World Champion II (FUT9000) Series radios are on the cutting edge of technology, and these new versions feature more advances than ever. Futaba has incorporated modelers' suggestions into making these systems the most user-friendly, top-of-the-line radios yet. The new features include:

- Gimbals on the 9Z Series WCII radios are beveled on top to provide a more sensitive surface for precision control.
- The inside switches now offer a third position that allows fliers to add a third flight condition.
- Switches also feature a stronger base, which makes them more durable and less prone to breaking off.
- The 1500mA receiver battery and 1100mA transmitter battery that come with 9Z Series WCII radios are much more powerful than the 1000mA and 700mA batteries in the original systems.
- The 9ZA (airplane) and 9ZH (heli) radios are available with transmitter, RX and TX batteries and carrying case only; this allows modelers to customize their flight-pack systems. These radios can be coupled with special servo combinations to appeal specifically to scale, IMAC and heli fliers.
- The synthesized versions (9ZAS and 9ZHS) allow pilots to fly on any 72MHz frequency without changing crystals and include an R309DPS receiver and frequency module; packs for these systems include S9101 or S9202 servos.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826; (217) 398-6300; fax (217) 398-0008; www.greatplanes.com.

Little Wulf

This is Global's new 1/12-scale ARF Focke-Wulf 190. The all-wood ARF is covered with high-quality iron-on covering and features a factory-painted fiberglass cowl.

What's great about this Fw are the choices you are given. It can be built for three channels (ailerons, elevator, throttle), and a rudder can be added, too. It can be built with or without a landing gear in either configuration. Best of all, it takes a wide array of powerplants. The little 190 was originally designed around the AP .09 to .15, but of course, any good 2-stroke of this size will also work well. The built-up frame of the model, however, is light enough to equip with an electric powerplant such as a Speed 400 and gear-drive setup or a Turbo 450 direct-drive motor (from Multiplex). With a strong .15 2-stroke, the 190 is a ribbon-cutting combat machine. Hardware is included.

Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Electric Boxcar

The C-119 Flying Boxcar was designed to fill the void in the electric twin arena. The model is constructed of balsa and lite-ply with plastic cowl, clamshell cargo door and cockpit cover. The model spans 45¼ inches, is 35¼ inches long and has a flying weight of 37 ounces on 8, 1000 cells. It's powered by two direct-drive DR S-400s.

The C-119 hand-launches easily and flies great. The model is stable and true and would make a great first twin. Designed by Pat Tritle, it will be kitted by Dare Distributors of Cumberland, MD. Kits will be available through local hobby shops and from Pat's Custom Models.

Pat's Custom Models, 10313 Snow Heights Blvd., Albuquerque, NM 87112-3054; (505) 296-4511; www.thuntek.net/pcmodels.

Lil' Trickler Multi

A trickle-charge adapter that plugs into a 110V wall socket, "Lil' Trickler Multi" provides a safe trickle for up to three standard chargers. The tiny device can keep your radio, glow starter and screwdriver batteries trickle-charging safely for weeks or months. Best of all, it's so simple, a blockhead can use it: plug Lil' Trickler in, plug the chargers into it and forget about it. Couldn't be easier.

RK Products, P.O. Box 950547, Lake Mary, FL 32795-0547; (904) 255-8431; fax (904) 257-9304.

⅕-SCALE Autogyro

Ever since the Gyro Captain flew his autogyro over the Outback in "Mad Max 2: The Road Warrior," I've dreamed of piloting my very own weird half-plane, half-heli autogyro. Just my luck: the Autogyro Co. of Arizona is now selling its ⅕-scale Kellett YG-1B autogyro, which can use a .61 2-stroke or a .91 4-stroke engine. I'll get you, Lord Humungus!

Autogyro Co. of America, 3307 W. Renee Dr., Phoenix, AZ 85027; (888) 783-0101.

SPY SHOT

Kyosho Corsair

I don't have too much info at this time, but here's a spy shot of Kyosho's Super Quality Series F4U Corsair. The model calls for a .40 to .46 2-stroke or .60 to .70 4-stroke engine. If the Corsair matches the quality of other Super Quality Series models, it should be beautiful.

Sonny Boy

Simprop's Speed 400-powered Sonny Boy is described as an easy flyer because it's a bit large (45-inch wingspan with 370 square inches of area) to be in the "slow flyer/park flyer" category. This big easy flyer is made of lightweight molded foam and requires only minimal assembly. The high-lift, under-cambered airfoil also contributes to Sonny Boy's excellent low-speed-turning flight characteristics—perfect for flying in confined areas. The wing breaks down into two pieces for convenient transportation.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948; www.hobby-lobby.com.

RC flying has never been easier

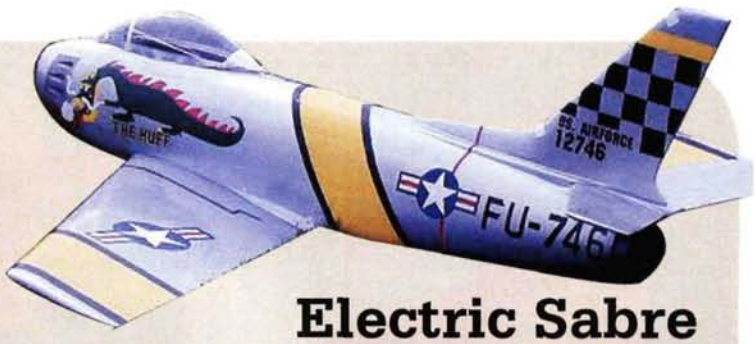
The Firebird is the first release in Horizon Hobby's new HobbyZone product line. The Firebird can be ready to fly in minutes and includes everything you'll need for flying except eight AA batteries. The best part is the patent-applied-for Flight Trac linkage system that allows you to "steer" the model around the sky much as you'd steer a car, but without the complexity of third-channel control. This system, coupled with the Firebird's super-stable 30-inch polyhedral wing, gives hands-off flight tracking until you command a turn. Proportional throttle provides for climb, cruise, or descent. The Firebird features molded poly fuselage, composite tail boom and resilient molded-foam flying surfaces. According to Horizon, the Max 200 motor and matched prop provide lots of thrust for strong climb-outs and enable you to fly for 10 minutes per charge.

Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 352-1958, ext. 230; www.horizonhobby.com.

Kicker in a Can

Zap's Zip Kicker superglue accelerator is now available in a convenient, 5-ounce aerosol can. With the increased pressure, Kicker can now get into nooks and crannies that were previously unreachable. The aerosol version is still compatible with all Zap products and other brands of CA and is still safe for plastics. Use your new bonding abilities wisely, Grasshopper.

Zap Glue, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.



Electric Sabre

Like all Schreiner & Savex (S&S) models, this fully molded F-86 Sabre is distinguished by molded-in fine details such as rivets and panel lines. The F-86 is designed for electric ducted fans by Schübeler. According to ShredAir, the North American distributor, these models also make excellent power scale slope soarers because of their RG14-derived airfoils. The F-86 spans 47 inches, is 47 inches long and weighs 34 ounces.

ShredAir, P.O. Box 10093, Eugene, OR 97440.

PILOT PROJECTS

A look at what our readers are doing

CANADIAN SEARCH AND RESCUE

Ivan Galloway of Courtenay, BC, Canada, built his Douglas DC-47 Dakota from Nick Ziroli plans. This 140-inch-span model uses two Zenoah G-38s to power its 47 pounds into the air. It is painted in 442 Squadron colors and is patterned after an aircraft used by the Royal Canadian Air Force in 1966 for its search-and-rescue operations. Ivan plans to enter it in two contests this year: one held at Comox Air Force Museum and the other, the Canadian Scale Nationals.

EXOTIC SYMMETRY

The smooth, flowing lines of Stratford Ryan's retro-design Parasol Wing Plane are evident. Stratford, a resident of Port St. Lucie, FL, designed the plane based on memory and four faded photographs of a free-flight model he built 50 years ago from plans that appeared at that time in *Model Airplane News*. The free-flight model had a span of about 34 inches. Stratford's updated RC version spans 72 inches, weighs 8¼ pounds and is powered by an O.S. .61. A 6-channel Futaba radio has provided control for more than 75 flights during the past two years. Says Stratford, "Flies great!"

EMERALD BEAUTY

Sit back and admire this gold-on-green color scheme. Dave Wenman of Aurora, OH, covered his ⅓-scale Cosmic Wind in MonoKote. This beautiful airplane spans 80 inches and is powered by an O.S. 300. The fuselage is fiberglass, and the wings are foam-cores.

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

WHAT IT'S ALL ABOUT

Frankie Mirandes of San Juan, PR, writes: "This is it. This is what it's all about. Sharing the hobby with my kids. Ricardo here cannot wait to get his hands on my Bandit. He is learning fast .... The Bandit—awesome! A pleasure to build, a pleasure to fly. RAM-powered. Simple and reliable. What more can you ask?" We couldn't agree more!

UP FROM THE ASHES

Louis Alexandrou of Nicosia, Cyprus, poses with his "Finix"—an original design created from scrap materials. The fuselage is made of 11cm-diameter PVC plumbing conduit, the tail booms are aluminum bars, the landing gear is taken from scrap army radio antennas, and the cowl is a plastic water bottle. The 35cc engine was taken from a weed-whacker, while the wings and tail surfaces are more familiar—simple structures built up from balsa.

SUSQUEHANNA SIKORSKY

Tom Ketcham of Lancaster, PA, flies his Sikorsky S-39 amphibian off the Susquehanna River as well as from his club's field. This fully amphibious sport-scale project spans 76.5 inches, weighs 7.5 pounds and is powered by two MDS .61s. Tom built his S-39 from scratch with a plan drawn by Bob Rich of Las Vegas, NV. Tom says, "I was intrigued by the plans because Bob specified a Goldberg Anniversary Cub wing, which I had—left over from a *very bad* landing."

SUCCESSFUL FIRST KIT

David Atkins flies in Columbia, MO, with the Mid Missouri Radio Control Association. His fourth airplane project, this Midwest CAP 232 is powered by a 41cc engine from U.S. Engines. The receiver and servos are from FMA Direct and have, David writes, "performed flawlessly." After flying three ARFs, he "felt it was time to graduate to a kit. The ARFs were necessary for me to get involved in the hobby due to time limitations, but building this kit has gotten me into the hobby hook, line and sinker."

AEROBATIC BIRD

Who says chickens can't fly? James Heuer of Lake Havasu City, AZ, reports that his Model Tech Sukhoi Su-29 is capable of good aerobatics and is steady on landing. The plane spans 62 inches, weighs 9 pounds and is equipped with a Magnum .91 4-stroke and an Airtronics VG 600.

RED BARON BEWARE!

Snoopy is ready for action with this flying doghouse built by Neil Gibbins of Huntington, WV. Neil's battle plan is to have a DR-1 dive at Snoopy out of the sun at his club's two-day show, a fund-raiser for cancer research. From that smile on Neil's face, we can tell the Red Baron doesn't stand a chance! (Better adjust that scarf, Neil; it's cold upstairs!)

MISSILE WITH A MAN IN IT

Kendall Wagner of Fullerton, CA, built this F-104 from the Avonds kit with an O.S. .91 and RamTec fan. The model is surprisingly easy to fly, according to Kendall, though it demands cool hands and a very watchful eye. It "requires a lot of throttle with flaps and gear down, or it drops like a brick." Sounds like the real Lockheed fighter!

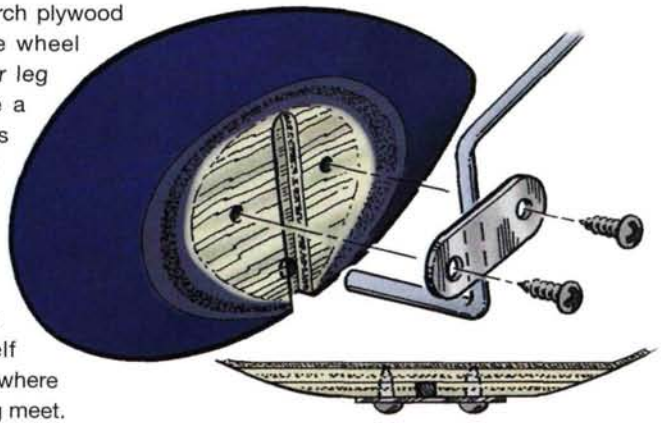
HINTS & KINKS

BY JIM NEWMAN

SEND IN YOUR IDEAS. *Model Airplane News* will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

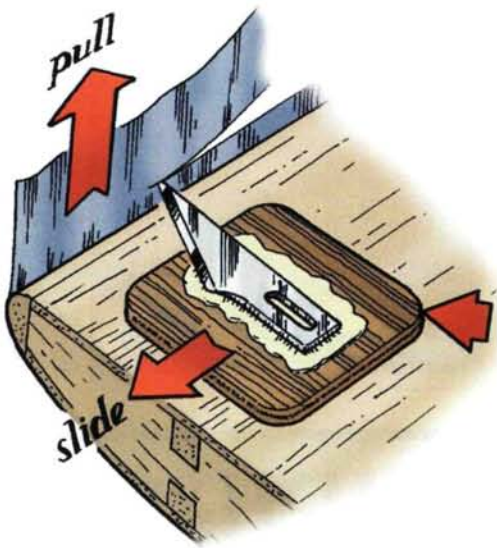
KEEP YOUR PANTS ON

Build two layers of birch plywood (one slotted) into the wheel pants. Bend the gear leg as shown, then use a metal strap and screws to secure it. If you put washers at each side of the wheel, you won't need collets to retain it. You'll have a very rigid pant fixing that lends itself well to a neat fairing where the pant and leg fairing meet.
Mike Styre, Tucson, AZ



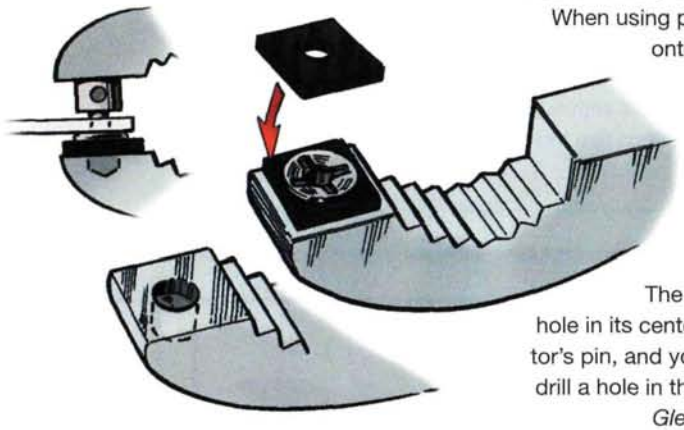
TINY TRIMMER

Glue a no. 11 blade to a piece of wood such as a die-cut punch-out, then use it to trim covering film to leave a fold-over flap. The width of the flap is governed by the thickness of the wood under the blade.
Jack Dundas, Ridgeville, Ontario, Canada



ATTRACTIVE HOLDER

When using pliers to press retainers onto pushrod connectors, you'll find the task much easier if you first glue a small piece of refrigerator magnet to the jaw of the pliers to hold the steel retainer in place. The magnet should have a hole in its center to clear the connector's pin, and you should also grind or drill a hole in the jaw to clear that pin.
Glenn Elliott, Houston, TX

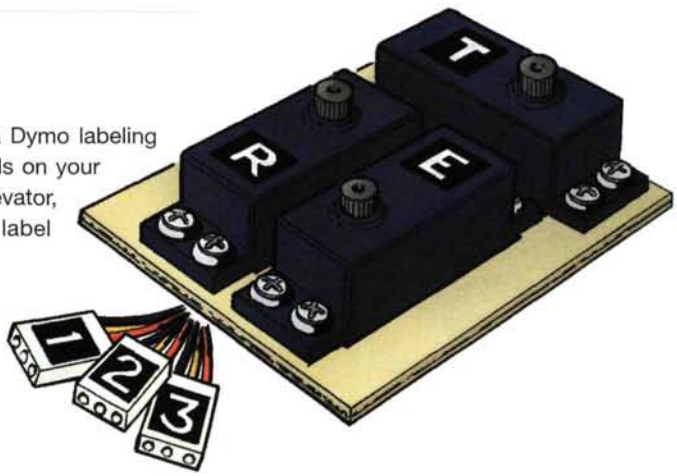


STIFFER STUFFED STRUTS

Stiffen hollow, light-alloy tube struts by stuffing shaped and epoxy-coated, hard balsa or spruce strips into them.
Don Giffin, Sarnia, Ontario, Canada

IDENTITY TAGS

Print and cut adhesive identity tags with a Dymo labeling gun from an office supply store. Stick labels on your servos to identify their functions (aileron, elevator, throttle), then stick tags on the plugs to label which receiver socket each plugs into.
George Poirier, Providence, RI



STYLISH BRUSHES

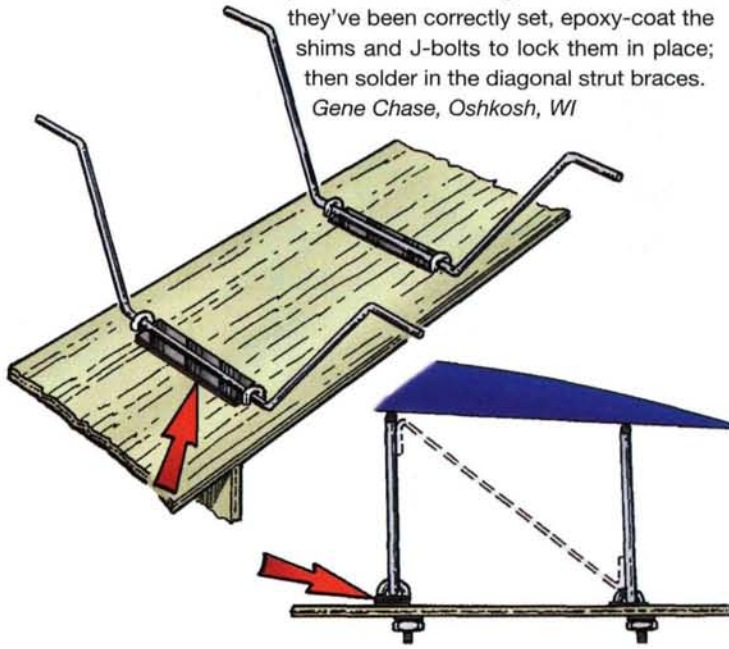
Give your metal-tube epoxy brushes an extra crimp in a vise to better secure the bristles, then trim them with shears to the shape you need for the job at hand. Before you use the brushes, blast them with an air hose to blow out any loose bristles.

Kevin Brushett, Walden, NY

SHIMMED-UP STRUTS

Many kit fuselages start with a soft, light plywood crutch to which struts are J-bolted; the struts will eventually work loose from the soft wood. Place a 1/32-inch (0.8mm) steel strip shim under each strut, then use more shims to adjust the struts for the correct wing incidence; use a Robart incidence gauge on the wing to check the wing incidence. Once they've been correctly set, epoxy-coat the shims and J-bolts to lock them in place; then solder in the diagonal strut braces.

Gene Chase, Oshkosh, WI



NO FENDER BENDING

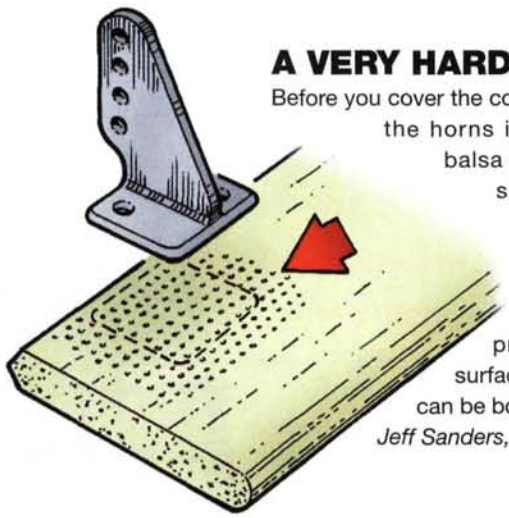
For your old-fashioned model, cut some old-fashioned "mud fenders" out of a can of a suitable diameter. Clean the surface thoroughly with solvent, then use a generous fillet of JB Weld to attach the fender to the leg. Lumps of modeling clay are great for jigging the fenders in place while the almost indestructible JB Weld sets.

Dan McMakin, New York, NY

TIGHTWAD'S WIRE BENDER

A very large door hinge with the middle "barrel" cut out makes a very efficient wire bender. Slip the wire under the hinge pin, clamp the hinge in the vise close to the wire, then grasp the hinge with large vise grips and pull. You'll make a very clean bend. As you bend, check the angle occasionally with a card template.

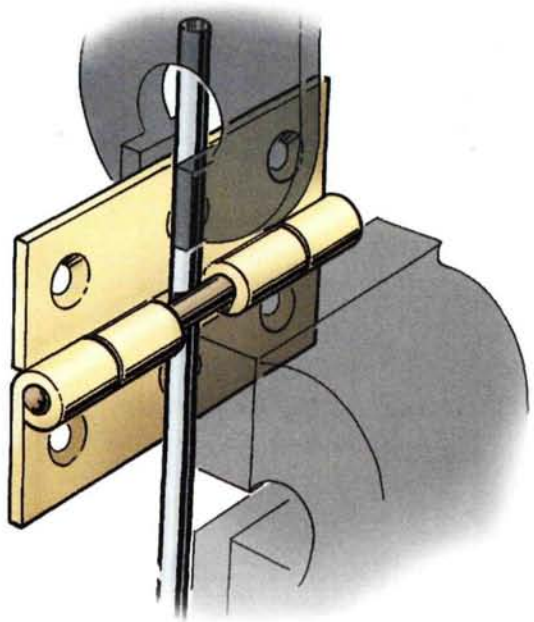
Ray Fairchild, Dearborn, MI



A VERY HARD BALSA

Before you cover the control surface and bolt the horns in place, pierce the balsa all the way through several times with a large T-pin, then wick thin CA into the holes from both sides. This provides a rock-hard surface to which the horn can be bolted.

Jeff Sanders, Port Washington, NY



4th GREAT RC AIRPL

Help the editors choose the winners

When poring over the submissions to our "4th Great RC Airplane Design Contest," we were thrilled by the entrants' originality and creativity. We've narrowed the field down to our top picks, but we need your help to make our final selection. The designs aren't presented in any particular order.

Please choose the three aircraft you'd like to see featured as construction articles in *Model Airplane News*. Then send your vote to Great Design Contest, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA, or email man@airage.com by November 1, 2000.

After considering your votes, the models' originality, craftsmanship and overall appeal, we will award the talented first- through third-place winners $1,000, $750 and $500, respectively, and runners-up will win a *Model Airplane News* T-shirt and 6-month subscription or subscription extension. Construction articles to highlight the winning aircraft as well as other notable entries will follow.

We thank all the modelers who worked so hard on their designs and made this contest a success. We're sorry that space limitations preclude our showing every entry.

1 **BEECH TWIN** • Keith Sparks of Fort Worth, TX, designed this Beech Twin. Powered by two .15 engines, it features a Styrofoam fuselage covered with fiberglass cloth and has a 63-inch wingspan.

2 **TURBO-BEAVER** • Don McTaggart of Ontario, Canada, submitted his 96-inch-span Turbo-Beaver floatplane. It's powered by a 1.20 4-stroke and sports molded-fiberglass floats, spinner and fuselage.

3 **PROFILE FIGHTER** Ray Smith of Marina, CA, sent a design that's reminiscent of an older, free-flight model. Built of balsa and covered in Econocote, the plane has a 36-inch wingspan and, at 12 ounces, is impressively light.

4 **FOAM STUKA** Keith Sparks of Ft. Worth, TX, designed this 58-inch-span foam Stuka. It's powered by a .32 engine, built mostly of foam and has a vacuum-formed canopy and exhaust stacks.

5 ▲ **HUMMING BIRD MK II** Also from Ontario, Canada, comes this interesting .46-powered canard called the "Humming Bird Mk II." Designer and builder Parker Leung notes that the 52-inch-span model is capable of vertical takeoff and landing with the help of two gyros.

6 **DiZy-3** • From Las Vegas, NV, Lee Van Tassle submitted a fun-fly DC-3 design he dubs the "DiZy-3." This model sports a 45⅝-inch wingspan and is powered by two .15-size engines. ▼

7 **SUPERMAN** *From Summerland*, British Columbia, Canada, comes Gerard McHale's fascinating Superman design, which is a full 72 inches long and sports a cape span of 50 inches. The Man of Steel is actually built of balsa, spruce and Styrofoam and is able to leap tall buildings with the help of a .61 engine.

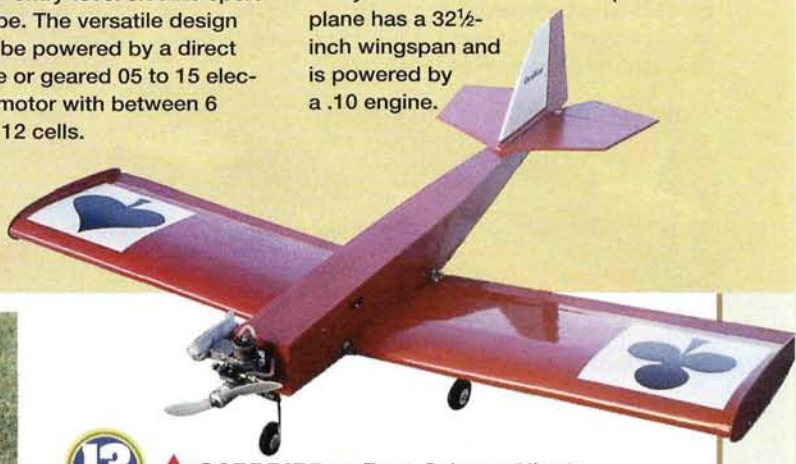
8 **GRUMMAN F7F TIGERCAT** David West, of Streamwood, IL, submits his Grumman F7F Tigercat—a giant-scale (82.5-inch-span) model he designed as a show-and-tell project for his flying club. It was designed to be powered by two .45 to .60 engines.

NE DESIGN CONTEST

9 SPRIG BIPLANE • Glenn Bolick of Mechanicsville, VA, submitted this balsa-and-ply "Sprig" biplane. It has a 24-inch wingspan and is propelled by a Speed 400 motor and 7 cells.

11 CLAYTON FIREBIRD Designed by Clayton Day of Grand Prairie, TX, the high-performance "Clayton Firebird" aerobatic sport plane has a 32½-inch wingspan and is powered by a .10 engine.

10 SPORT COUPE John Chapis of Seaford, DE, designed this 60-inch-span entry-level electric sport coupe. The versatile design can be powered by a direct drive or geared 05 to 15 electric motor with between 6 and 12 cells.



12 ¼-SCALE FRENCH CAUDRON • Al Masters, from Rocky River, OH, submitted his ¼-scale French Caudron racer—a 67-inch-span plane that has been converted from gas to electric power and now sports an Astro 60 motor and 32, 1400 SCR cells.

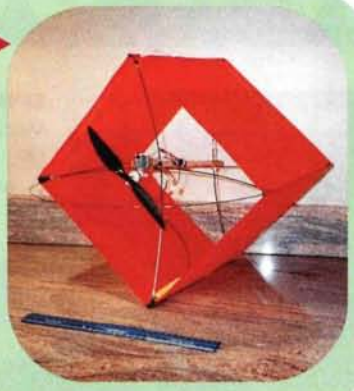
13 CARDBIRD • From Calgary, Alberta, Canada, comes James Dennis's .46-powered "Cardbird," which, as you might have guessed, is constructed mostly of corrugated cardboard. The 52-inch-span foam wing is covered in cardboard; Dennis says ease of repair allows him and his friends to fly the Cardbird more aggressively without worrying about crashes.

14 BUNTING I Henry Haffke of Londonderry, VT, provides his latest creation—a Curtiss Wright Bunting I with a 72-inch wingspan. It is powered by a .40 engine and features dummy engine cylinders.

15 CANADIAN CL415 From Burnaby, British Columbia, Canada, comes Anton Eisele's 68.5-inch-span scale model of a Canadian CL415 water bomber. It was originally powered by two .15 engines, but Anton converted it to electric power with two Magnetic Mayhem motors and 16, 2000mAh cells.

4th GREAT RC AIRPLANE DESIGN CONTEST

16 FLOATING CUBE • This design was submitted by Lance Liotta of Bethesda, MD. The "floating cube" is 16 inches square and weighs just 84 grams. Power is provided by a tiny coreless motor that's mounted directly on a servo output shaft. It doesn't have control surfaces; direction and speed are controlled by the orientation of the prop.



17 BATTLEAXE • The "BattleAxe" is a canard design by Tony Newsom of Oakland, CA. A .36 engine powers its pusher prop. Its total wing area is 593 square inches, and it has inboard flaps that can be configured for regular flap operation or coupled with the front canard (elevator) for enhanced pitch control.

18 GLASSIE • This sport design was submitted by Peter Riddle of Kentville, Nova Scotia, Canada. The "Glassie" has a 48-inch wingspan, can be powered by a .15 to .25 engine and is covered in clear MonoKote.

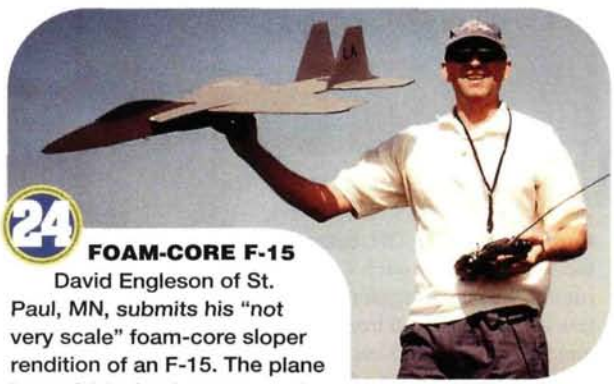
19 MILES HAWK MAJOR • Bob Taylor of Mesa, AZ, designed and built this scale Miles Hawk Major using drawings and photos from Bob Banka's Scale Model Research. The 69-inch-span model is powered by a .70 4-stroke and weighs 6 pounds.

20 CANARD X-7 • From Scottsdale, AZ, Stephen Yip submits a canard design he calls the "X-7." The plane has a 42.5-inch, sheeted foam-core wing and is powered by a .15 engine. It also has elevator, aileron and ailevon control and 300 square inches of wing area.

21 TEFLON • Keith Carr-Glynn of Victoria, Australia, sent us this submission—a 48.5-inch-wingspan tail-dragger sport aerobatic plane. Named "Teflon," it was designed for .30 to .46 engine power.

22 HITCH HIKER • Also from Peter Riddle of Nova Scotia is "Hitch Hiker"—a sport plane that features a miniature airframe riding on top of the stabilizer. It has a wingspan of 54 inches and can be powered by a .40 to .46 engine.

23 GRAND PARADOX This powered glider comes to us from Justin Cork of Collingswood, Ontario, Canada. His "Grand Paradox" sports a 12-foot wingspan and reaches gliding altitude with the help of a 4-stroke .52 engine.



24 FOAM-CORE F-15 David Engleson of St. Paul, MN, submits his "not very scale" foam-core sloper rendition of an F-15. The plane has a 34-inch wingspan, and David notes that it is very stable in the air.

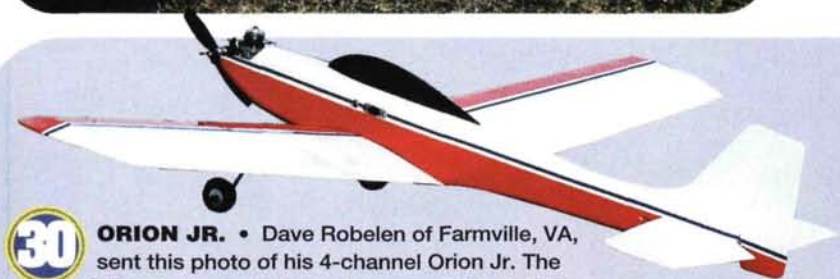
27 ULTRALIGHT SKYLARK • All the way from the Netherlands comes Jan Leeuwestein's ultralight "Skylark." The plane has a 146.7-inch wingspan and uses a 1.20 to 1.60 engine. Jan says he has attached floats and skis and flown this plane off water and snow without a hitch.

25 BOOMERANG Joseph Colletti of Chalmette, LA, sent us this photo of his scale Boomerang, which we featured in "Pilot Projects." The 81-inch-span model flies with the help of two .52 4-stroke engines.

26 MILES SPARROWHAWK This scale Miles "Sparrowhawk" is the handiwork of Dick Allen (Endicott, NY). This 6-62-powered 88-inch-wingspan plane has also been built in 80- and 58-inch-span versions. The full-size plane was an English racer built for the 1935 King's Cup race.

28 SMITH SPORT ONE • Scott Smith of Auburndale, FL, submitted this 51-inch-span aerobatic design—Smith Sport One—for our consideration. It weighs 4¾ pounds and is powered by a .46 engine. A fiberglass cowl and plastic canopy complete its scale look.

29 CAP-10B • Carl Layden of Manuels, Newfoundland, Canada, designed this 5.5-pound sport-scale CAP-10b using a 3-view. Powered by a .46 engine, the 57-inch-wingspan model is "very aerobatic."



30 ORION JR. • Dave Robelen of Farmville, VA, sent this photo of his 4-channel Orion Jr. The 37.5-inch-span plane can be powered by a .049 to .061 engine and weighs only 13.5 ounces without fuel.

31 PHANTOM FLYER • Woodworker Bruce Kunkel from Nashville, TN, crafted a nostalgic design he calls the "Phantom Flyer." Other versions of this plane have been powered by gas engines, but this 67-inch-wingspan model is powered by a geared 15 electric motor.

32 DE HAVILLAND 60GMW • Stan Rutz of Muskegon, MI, designed this 60-inch-span model of the American-built de Havilland 60GMW that was sent overseas to star in the film, "Out of Africa." It uses a .48 Surpass for power.

MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

World Models Mfg. Midget

by Jim Onorato

SPECIFICATIONS

Model: Midget Mustang ARF

Manufacturer: World Models Mfg.

Distributed by: AirBorne Models

Type: ARF sport-scale racer

Wingspan: 60 in.

Wing area: 668 sq. in.

Airfoil: semisymmetrical

Weight: 7 lb., 8 oz.

Wing loading: 25.9 oz./sq. ft.

Length: 51 in.

Radio req'd: 4-channel w/5 servos

Engine req'd: .60 2-stroke or .90 4-stroke

Engine used: MDS .58 2-stroke

List price: $249.99

Features: 90-percent-complete ARF. Balsa construction with iron-on film covering. Prepainted fiberglass cowl and wheel pants. Transparent dummy cowl to assist engine installation. Balsa-sheeted, built-up wing with semisymmetrical airfoil. Built-up tail feathers. All necessary hardware provided, including spinner, fuel tank, wheels and even a pilot.

Hits

- Excellent flight performance.
- Good overall appearance.
- High-quality, prepainted, one-piece fiberglass cowl and wheel pants.
- Precision engineered for ease of assembly.
- All hardware included.

Misses

- Pale yellow film covering not opaque enough to completely hide grain of balsa sheeting.

PHOTOS BY JIM ONORATO

Mustang ARF

If you want to get into the air quickly and fly fast, then put the World Models Mfg.* Midget Mustang at the top of your list. This plane is 90-percent complete and includes everything you need to get airborne except radio, engine, fuel tubing and propeller. Even a pilot figure is included! World produces this 60-inch-span racer in four colors: lemon yellow with black checkerboard markings, dark blue with U.S. Navy markings, Cub Yellow with tiger stripes and white with blue markings. I was pleased to get the lemon-yellow model for review because it's easy to see in the air (and at my age, that's important!).

Sport-scale Formula One racer

As I examined the kit contents, I was pleasantly surprised by the excellent quality of materials and workmanship that went into this model. It is constructed mainly of balsa, is fully sheeted and covered with iron-on film. A few wrinkles in the covering were easily removed with a heat gun. The fiberglass one-piece cowl and wheel pants are spray-painted to match the covering. The paint job on these parts is outstanding. The stab is an assembled balsa frame, while the elevator, fin and rudder are solid ¼-inch-thick sheet balsa. All are expertly covered. All control surfaces are already hinged with almost no gaps. A fuel tank, landing gear, sponge tires, tailwheel, engine mount, spinner, pushrods, molded canopy, pilot and complete hardware package (with metric nuts and bolts) are also included.

An 11-page instruction booklet guides you through assembly without the need for a full-size plan. The instructions include a lot of symbols and drawings, and there are only 23 steps in the model's assembly.

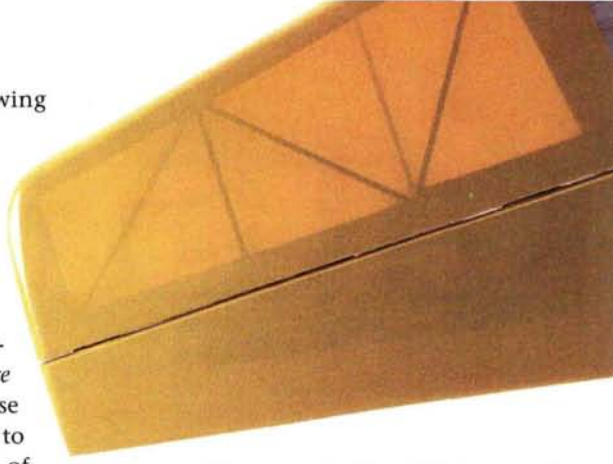
WING AND TAIL ASSEMBLY

The Mustang wing comes in halves and requires two servos for the ailerons. The servos are mounted on two wooden blocks glued directly on the aileron servo covers, which, in turn, are held in the wing with four small wood screws. I replaced the balsawood servo-mounting blocks provided in the kit with

hardwood and attached the servo horns to the ailerons with the hardware provided. A piece of monofilament is factory-installed in each wing half, so the servo leads can be routed through the wing ribs to the center—a nice touch!

The instructions call for installing the landing gear on the wing halves before they are joined. I chose to join the wing halves before assembling the gear because the wing was easier to handle that way. I joined the wing with 30-minute epoxy on the root ribs and the wing joiner. The wing joiner fit snugly into the wing-joiner pockets, and a small pin in the root ribs helps to keep the halves aligned—another nice touch! The holes for the wing hold-down bolts are predrilled in the wing halves, and the blind nuts are already installed in the fuse. When I attached the assembled wing, I was amazed: the fuse and the bolts lined up perfectly!

I jumped ahead in the instructions and installed the wing *before* I installed the tail feathers because I thought it would be a lot easier to adjust the tail feathers instead of the wing, if things didn't line up. As it turned out, everything lined up perfectly without any cutting or shimming; I was really impressed by the precision with which this ARF was manufactured. I attached the tailwheel assembly to the fuse with two screws, then went back and attached the landing gear, landing-gear covers, wheels and wheel pants.



The strong, built-up tail structure is light and sturdy.

The World Models Mfg. Midget Mustang kit as it comes out of the box. The well-built parts are covered and hinged, and you can be airborne in no time at all!

POWERPLANT INSTALLATION

Next, I assembled and installed the fuel tank and fittings. The tank has a third tube that's used only for filling; I ran this line out through the opening in the bottom of the cowl.

The firewall is offset to provide right thrust, and the blind nuts for the engine-mounting bolts are already in place. I drilled through the fuse sides into the firewall and glued in six ⅛-inch-diameter dowels to reinforce the firewall/fuse joint.

FLIGHT PERFORMANCE

FLIGHT PERFORMANCE

The first flights of the Midget Mustang took place on a sunny day with almost no wind. I used the recommended throws for high rate and set the low rates at 60 percent. The initial flight was at low rate. The runway was freshly cut grass.

• TAKEOFF AND LANDING

Since there was almost no wind, I opted to take off straight ahead. I held in some up-elevator to keep the tail down and slowly advanced the throttle. The plane tracked beautifully without any need for right rudder. As the tail came up, I released the up-elevator and continued to advance the throttle until flying speed was attained. Just a touch of up-elevator is needed to get the Mustang to lift smoothly into the air. With just a touch of up-trim and a bit of right aileron trim, the Mustang is in the groove.

The Mustang has a surprisingly shallow glide slope that makes landings a real pleasure. I set up a long approach and throttled down to establish the rate of descent while using a slight amount of up-elevator to bleed off some airspeed. Because the Mustang has wheel pants and I was landing on a grass field, I tried to flare just enough for a 3-point landing. My only problem was getting the plane to settle. It just kept on flying and took a while to slow down.

• LOW-SPEED PERFORMANCE

Although the Mustang is designed for high speed, it handles very well at all speeds. When I forced a stall at a safe altitude, the plane pitched upward about 15 degrees before the nose fell. When it did stall, the stall was gentle and straight ahead.

• HIGH-SPEED PERFORMANCE

This is really where it's at! After all, the Midget Mustang is a sport-scale racer and is designed for speed. It grooves well and is very responsive at full throttle. Pylon turns are really impressive. However, with a 12x7 prop on the MDS .58, I'm sure the Mustang was not flying at its maximum potential. The plane was plenty fast for me, and I'm sure that a higher pitched racing prop would significantly increase its speed.

• AEROBATICS

Even though the Mustang is not intended for aerobatics, I couldn't resist seeing what it could do. I was not disappointed! It performs high-speed loops without rolling out or losing heading, and its high-speed rolls are perfectly axial. With aileron throw at high rate, the rolls were so quick I wouldn't have had time for elevator correction even if needed. It does nice slow rolls, but elevator and rudder coordination is required. Snap rolls are very crisp. Inverted flight requires quite a bit of down-elevator to maintain altitude. Sustained knife-edge is a breeze, as are outside knife-edge circles.

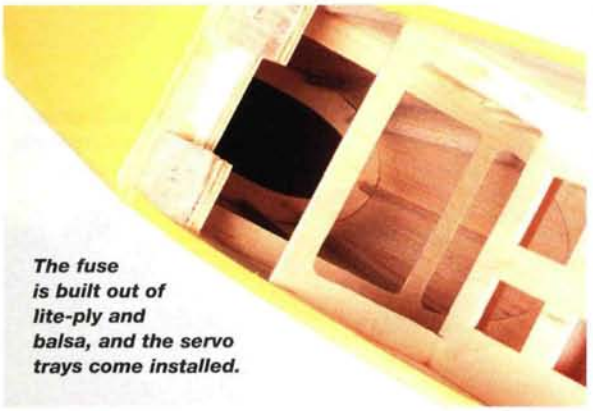
Overall, I would say the Midget Mustang has excellent flight performance with no bad tendencies.

I then installed the adjustable engine mount and engine with the hardware provided. I used an MDS* .58 2-cycle engine mounted sideways and added a Soundmaster* SM-I Super Silent muffler. The kit includes a plastic spinner, but I replaced it with a 3-inch TruTurn* aluminum spinner that gave the Midget a really classy look.

It's always nerve-racking to take a Dremel tool or other device to a beautifully finished cowl to make the necessary openings for the engine and muffler. After all, who wants to screw things up at this point? To avoid all that anxiety, World Models provides a clear dummy cowl half that you temporarily attach to the fuse so you can see exactly where to mark the locations of the various cutouts. You then remove the dummy, make the cutouts, and when you are certain they're all in the right place, you place the clear dummy over the painted cowl and transfer the cutout locations—really slick! After I made all the cutouts, I attached the cowl with five small sheet-metal screws.

The plywood firewall comes drilled and with blind nuts installed for easy engine installation.

I mounted three standard servos in the factory-installed servo tray and made up the rudder and elevator linkage rods per the instructions. All the necessary hardware was included in the kit. I never use EZ-type connectors on primary controls, so I substituted L-bends with snapper-keepers on the elevator and rudder pushrods. The rudder and elevator pushrods are made of dowels with 1.7mm wire on each end. The elevator pushrod has two threaded wires on the control-surface end, one for each elevator half; the wire on the servo end of each pushrod is unthreaded; the throttle pushrod is a solid wire.



The fuse is built out of lite-ply and balsa, and the servo trays come installed.

I placed the receiver and the battery in the cutouts in the foam-rubber block provided in the kit and placed the block in front of the servo tray. The CG came out 3½ inches behind the leading edge of the wing, as recommended in the instructions.

I then glued in the pilot figure (also included) and attached the canopy with five small screws. The final step was to apply the decals. The locations of the decals are not shown in the instructions, but they are shown clearly on the box.

FINAL THOUGHTS

The word "kit" really doesn't apply to ARFs and certainly not to this one. I found the World Models Midget Mustang ARF to be extremely well-made. It was easy to assemble and looked good when it was finished. It is manufactured with precision and includes some well-thought-out features that make it a pleasure to build.

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.* +

You can use the clear plastic cowl piece to position the screw holes and other openings on the fiberglass cowl—a nice touch.

by Jim Sandquist

AEROTECH MODELS

P-47 THUNDERBOLT

"If you wanted to have your picture taken so you could send it home to your girl, you sat in the cockpit of a P-51 Mustang. If you wanted to survive in combat, you climbed into the cockpit of a P-47 Thunderbolt." This wisdom reflects the rugged dependability of the P-47 that brought many pilots safely back home after sustaining battle damage that would have destroyed almost any other fighter. The Thunderbolt could dish it out as well; it was the most heavily armed single-engine fighter in WW II. It had twice the firepower of most Mustangs and 50 percent more than the P-51D Mustang, P-40 Warhawk, F6F Hellcat, or F4U Corsair. Though the Mustang was sleek and certainly had considerable eye appeal, some believed that the appearance of the large, rugged Thunderbolt better exemplified what a fighter should look like. As a modeling subject, the P-47 may be one of the most popular and best flying airplanes you could ever consider building. Because of many variants

and armament configurations, your model is sure to look different from any other P-47 that might show up on the flightline.

AN EXCEPTIONAL KIT

The Aerotech Models* P-47 is available in either B or D configurations. I chose the D version, but I have also had a chance to fly the B version. The planes fly virtually the same. When you open the box, the first thing you will notice is the high quality and completeness of the kit. It comes with molded scale scoops, hoods and inner gear doors, Robart retractable main gear and tail gear, an engine mount, a

The underside of the wing: you can see the cannon placement, the openings where the shells were expelled and the very detailed landing gear and gear doors.

The optional cockpit kit adds a lot of realism to the plane's interior. The kit is also available with a sliding canopy.

This gives you an idea of the detail achieved by this kit: scale dummy engine, Hamilton Standard propeller, exhaust outlet and vents.

SPECIFICATIONS

Model: Republic P-47

Type: scale WW II warbird

Manufacturer: Aerotech Models

Wingspan: 82 in.

Length: 69 in.

Weight: 31 lb.

Engine used: Brison 4.2 with CH ignition

Radio req'd: 6-channel (elevator, rudder, ailerons, flaps, retracts, throttle)

Radio used: Futaba 9 ZAWS, R129DP receiver, 8 servos

Price: $2,895 (basic kit)

Features: carbon-fiber fuselage, wings and tail surfaces; scale Fowler flaps; plug-in wings; 2½-hour construction video.

Comments: Aerotech's P-47 Thunderbolt is a beautiful scale warbird with excellent flight characteristics. The carbon-fiber airframe comes highly detailed with all panel lines and rivets molded in. Many scale options are available for the airplane, and the builder can achieve degrees of realism ranging from excellent to outstanding. Fully functioning Fowler flaps and options such as scale exhaust ports are representative of the fine engineering that sets this kit apart. In flight, this muscular-looking warbird is stable yet capable of realistic military maneuvers. This P-47 can be built in either B or D versions—a truly beautiful and versatile kit for the serious scale modeler!

HITS

- Well-written instructions and a good 2½-hour instructional video.
- Complete hardware package.
- Includes Robart retractable main and tail gear.
- 5½-inch scale wheels are included.
- Landing gear plates, Fowler flaps and ailerons are all precut and prehinged.

MISSES

- None.

FLIGHT PERFORMANCE

During my aircraft's initial flights, I followed Aerotech's setup for CG and control throws. They proved to be about perfect for a scale warbird. From the first flight, this airplane has been a solid performer. By the end of my third flight, I felt ambitious enough to head to a scale contest!

With the Brison 4.2 engine for power, this airplane performs like a very powerful fighter, which is what the P-47 was. For scale flying, you can bring the throttle back to about 60 percent power, yet when you need vertical for loops and chandelles, the engine really delivers.

For those of you who have not had previous flight experience with warbirds, the P-47 is a perfect choice because it is a very forgiving aircraft. The flaps allow it to slow nicely for landings; the plane goes *exactly* where you point it. For those of you interested in competition, performance is as close to scale as you will find anywhere.

• TAKEOFF AND LANDING

For taxi and takeoff, the P-47 has a nice, wide-stance landing gear. This airplane has excellent ground-handling characteristics, and it is very difficult to ground loop. From the centerline, a gradual application of power will send the plane down the runway with the tail coming off the ground at about 25 percent of the takeoff roll. Whether the tail is on the ground or has risen into the air, the plane is very controllable. A slight amount of right rudder keeps the plane straight down the runway. A nice gradual climb-out following liftoff gives the impression that you are flying a heavy metal bird, yet it performs like a lighter weight aircraft.

When you set up for landing, the gear are extended on the downwind leg, and full flaps are lowered on the crosswind leg. The plane shows little or no tendency to balloon with full flap deployment. Final approach requires you to carry about ⅓ throttle till just above the runway threshold. Throttle back, and the plane settles in very nicely. The plane performs best if you set it on the mains. Three-point landings are a bit harder to perform consistently but certainly are possible.

• GENERAL FLIGHT PERFORMANCE

The Brison 4.2 combined with a 22x10 propeller makes a great power combination for this model. Once airborne, the plane does whatever you want it to do. Big loops, military rolls, climbing victory rolls and chandelles—my favorite—are all possible. This airplane exhibits no bad flight characteristics. Stalls are not violent and are very predictable; the nose simply drops, and the wings remain level throughout the stall. This is an enjoyable model to fly.

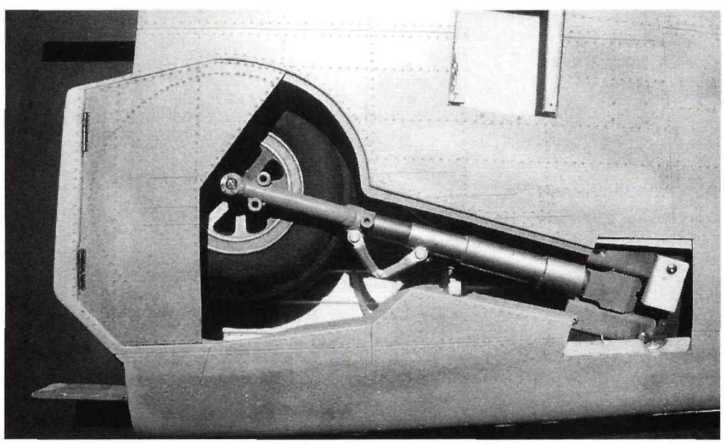
canopy, a gas tank, a radial dummy engine, 5½-inch scale wheels, servo trays, 3-view drawings, all the hardware needed to complete the kit, thorough instructions and a 2½-hour construction video. You will be stunned by the accuracy, quality and level of detail that is molded into the airframe. Aerotech designed this P-47 as an exact scale representation, including rivets, Phillips-head screws, dzus fasteners and all panel lines. All of these details are molded into the silver gelcoat surface of the carbon-fiber fuselage. I built my model in about 50 hours, and the fully painted model was in the air after about 80 hours! If you like great-looking model airplanes but don't think you have the time to build one, this model will be a pleasant surprise.

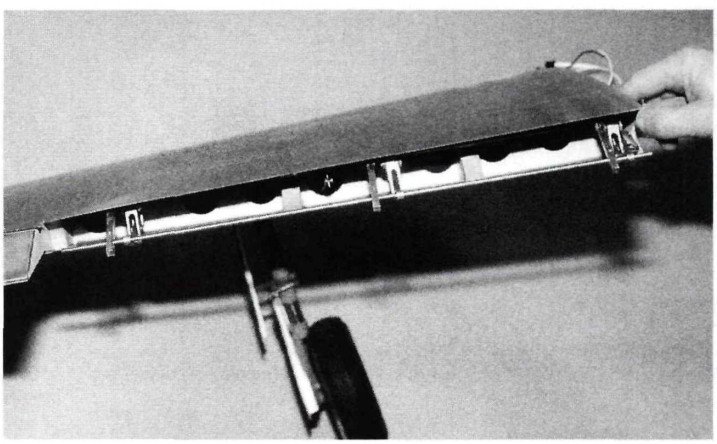
WINGS

When you take the wings out of the box, you will see that the molded ailerons and flaps have been cut, hinged and installed in the wing. This is almost worth the price of the kit alone. The ailerons use Robart Large Point hinges, and the flap hinges are an exact-scale miniature re-creation of the flap mechanism that was used on the full-size aircraft. The Fowler flap mechanism has to be seen to be fully appreciated. It is the neatest setup for a flap that I have ever seen.

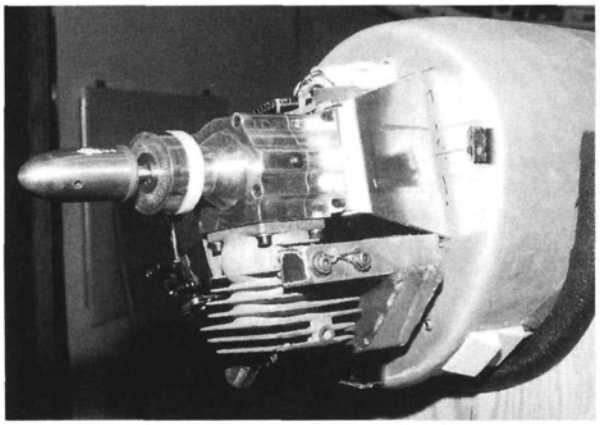
The mounting locations for the aileron and flap servos are premolded into the surface of the wing. You cut out the openings with a hobby knife or a Dremel tool. The part you cut away serves as the hatch cover when you complete the servo installation. After you've cut the openings, the wooden mount for the servo is visible and ready for the installation! It is really nice to have the servo mounts pre-installed and in a way that is not only functional but also maintains the scale outline required for competition.

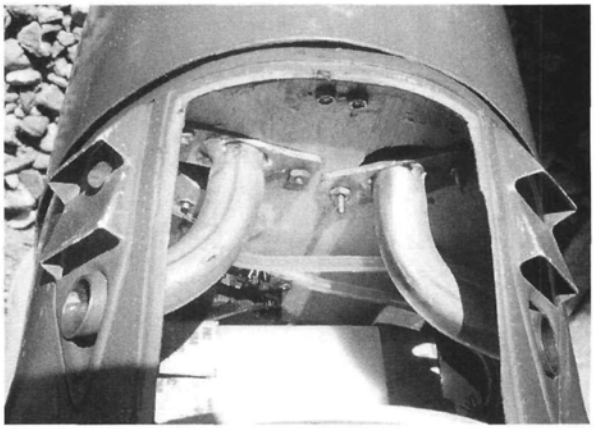
The next step is to mount the wings to the fuselage. This process is somewhat tedious; it isn't difficult, but to ensure that





Left: the landing gear fits nicely into the wing. The highly detailed scale doors completely enclose the gear after they have retracted. Right: this close-up gives you a look at the Fowler flap mechanism with the flap removed. It's identical to the one on the full-size plane!





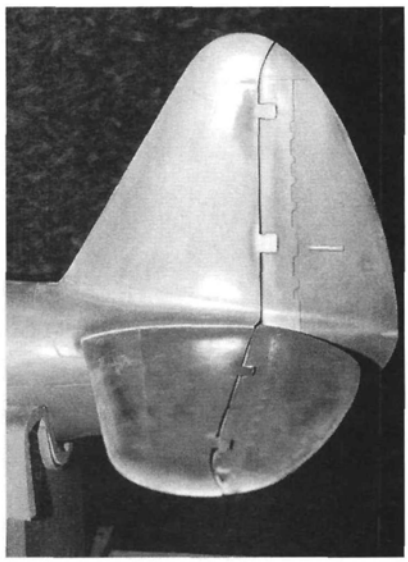
Left: the Brison 4.2 is the perfect powerplant for this model. The aluminum engine mounts are included in the kit; the custom muffler is an Aerotech option. Right: the exhaust tubes exit the aircraft behind the firewall; this permits a completely hidden, scale exhaust system.

you install the wings accurately, it is important to take your time. Each wing half has two aluminum spars that slide into an aluminum channel that you mount into the fuselage. The bulkheads that these channels are mounted to are also pre-installed in the fuselage, so it's quite simple to find where to attach the channels.

After you have mounted the wing to the fuselage, the last step is to install the Robart retractable main gear into the wing. As you did with the servos, cut away the area for the retracts with a hobby knife or Dremel tool. The metal landing gear plate is already mounted and cut to size for the retracts. To mount the retracts, you will have to drill and tap four 4-40 holes in the plate for each of the main gear. If you have had difficulty with previous retract installations, you will be pleasantly surprised by this one. You cannot install the gear incorrectly!

FUSELAGE AND POWERPLANT

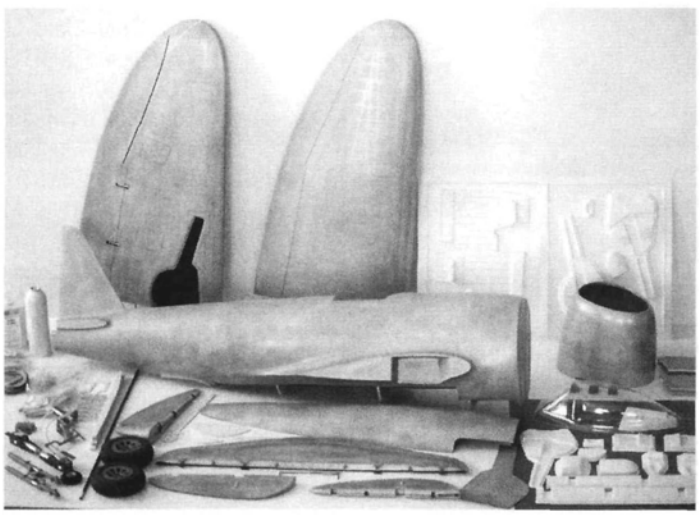
The difficulty with almost any scale model is having good access to the interior of the fuselage while retaining all of the scale outline and detail. The P-47 doesn't have this problem. A self-locking belly pan on the bottom of the fuselage extends from the firewall all the way back to the tail gear. When it is removed, you'll be able to get both of your hands and arms into the fuselage. This is very helpful when you install the servos, tail gear, pull/pull system for the rudder and the cockpit interior.



This is what the tail looks like when everything has been completely assembled. Even without paint, it looks great!

The fuselage comes with all of the bulkheads and servo trays installed. You will spend some time attaching the wooden blocks that are used to secure the belly pan to the fuselage. This is not difficult but does take a little patience to achieve a good fit between the belly pan and the fuselage. The elevator is controlled by a carbon-fiber rod. The rudder and tail gear are controlled with a pull/pull system.

Like the bulkheads, the firewall is also installed and ready to receive the aluminum engine mount. You can order the P-47 with either the mount for the Brison 4.2 or the Zenoah G-62. I chose the Brison 4.2 because I've flown it for years. The Brison 4.2 allows this aircraft to look very scale, whether it is cruising or in a climbing victory roll! One of the nice options available for this kit is an internal muffler system that allows the engine and the muffler to be completely hidden inside the cowl and fuselage; the exhaust escapes through a scale outlet!



The high quality of the kit components is evident. The fiberglass parts are very detailed.

TAIL SURFACES

The stabilizer, rudder and elevator are also made of carbon fiber. Attention to detail is excellent. When you assemble the tail surfaces, you must hinge the rudder and the two elevator halves using Robart hinge pockets and hinge-point hinges. The tail surfaces are the only parts of the model that are not pre-hinged.

The stabilizer is installed through the tail of the fuselage. Begin by cutting an opening in the fuselage. (This opening is clearly indicated in the instructions and is easily made with a Dremel tool.) Installation is straightforward. The elevators are tied together with a torque rod that is easy to install.

ACCESSORIES

This is a very complete kit, but to keep it affordable, some of the more scale items are optional. These items include a full cockpit, a full-body pilot, fiberglass bombs and drop tanks, an optional dummy radial engine (either the Hamilton Standard or the Curtis Electric), molded pylons and stabilizer arms, an aluminum flying spinner, Hamilton Standard or Curtis Electric 4-blade static propeller and a sliding canopy. The *Aero Detail Book* on the P-47 is also available. These options aren't necessary, of course; the basic kit allows you to build a model

that is incredibly detailed. The options allow you to take a really good model and transform it into one that's extraordinary!

PAINTING AND DETAILING

Some of the scale components are made of ABS plastic (inner gear doors, wheel wells, etc.). Because they are vacuum-formed, it is difficult to get details such as rivets and fine panel lines. You may want to give this area some attention and add some detailing. It's very easy to prep the model for paint. The entire airframe is covered in silver gelcoat, so the bulk of the airplane requires only a light sanding with 400-grit sandpaper. Bondo should be used to prep the seams down the center of the fuselage and on the leading edges of the stab and vertical fin. It took me about three hours to prep the model for painting.

After all the preparations had been completed, I used an automotive acrylic lacquer to create the final finish because the aluminum color was a pretty good match to the weathered aluminum of the old warbirds. Because of the gelcoat finish on the model, very little paint and virtually no primer were required. Using little primer helps to keep the weight of the final finish to a minimum.

SCALE COMPETITION AND BEYOND

Often kit manufacturers and reviewers will tell you that a certain kit is accurate to scale without offering any proof that it really is a competition-worthy model. Aerotech includes the original 3-view drawings that were used in designing the model. I have had my airplane in competition, and the judges were hard-pressed to find anything wrong with the outline of the model. In the national competitions that I participated in, the static scores were in the 95 to 96 range. Is this plane capable of being a serious candidate for winning a contest? Yes! At the 1999 AMA Nats, I flew an Aerotech P-47B in Team Scale and won the competition.

If you love scale models the way I do, this kit will more than meet your expectations. This is a solid flying airplane with no bad characteristics. The combination of great appearance, excellent flight performance and low construction time makes this kit a winner.

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.* +

MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

Simple-scale easy flyer

HOUSE OF BALSA

★ Super Decathlon

by Randy Randolph

The Aeronca Champion was always one of my favorite airplanes. It was comfortable and roomy on the inside and a very nice airplane to fly. The Aeronca Super Decathlon is a direct descendant of the Champ, and its influence is still visible. The Super Decathlon inherited a certain friendliness from its "great granddad."

The House of Balsa* .061 to .10 kit of the Super Decathlon produces a friendly airplane, too. It is more "reminder" scale than a true rendition, but the flavor is there. The laser-cut parts are excellent, and the parts that are die-cut are of top quality. The wood is good and fairly well matched to its intended use. The hardware package, though not complete for a full-house radio installation, is fine for 2-channel operations and is of good quality. A well-illustrated manual is included, and the plan does its job.

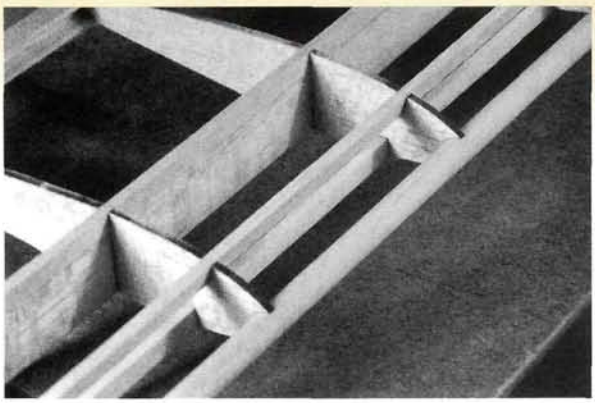
In building the kit, I followed the sequence in the instruction manual as closely as possible with only a few out-of-sequence steps—usually small jobs that could be done while I waited for glue to cure.

WING CONSTRUCTION

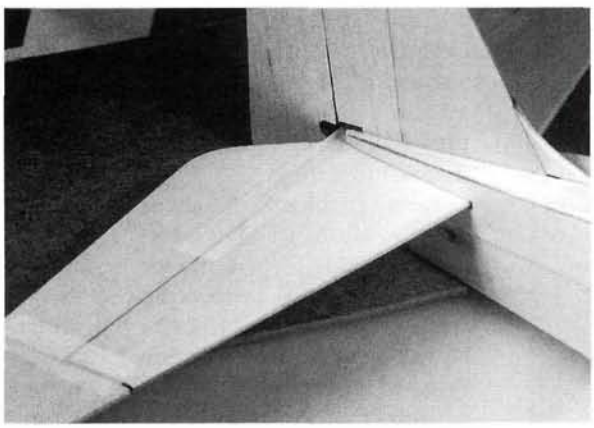
Whenever I build an airplane, I start with the wing; the Super Decathlon instruction manual agreed with me and suggested starting with that piece. The trailing edge (TE) is pinned over the plan on the building board, followed by the laser-cut

main spar and the ribs. The main spar has deep notches that receive the ribs. When the ribs have been installed and the top main spar is in place, the result is a full-depth spar that is light and strong. The TE is built of three pieces and is very warp-resistant. The leading edge (LE) is a cedar dowel that fits perfectly into the ribs. Although the dowel is on the heavy side, it makes the wing easy to finish and smells good when sanded. Before you know it, the wing halves are on the bench ready to receive the tips, bottom LE spar and center sheeting. It would have been a real help if the manufacturer had beveled the center joint of the main spar to the dihedral angle.

You need to make a groove for the aileron torque rods in the aileron stock that forms the center of the TE. The servo location is offset to miss the joint where the wing panels meet, so one torque rod must be longer than the other. Before you cement the TE and hardware into place, it is a good idea to smooth some petroleum jelly along the length of the torque rods that are covered by the balsa. That will help to keep the rods from being cemented along with the TE stock.



Above: the provided leading edge is a round hardwood dowel that's sturdy and easy to handle. Below: laser-cut notches in the fuselage sides and top ensure that the tail surfaces will be accurately joined to the fuselage. They came out dead straight!



Next, you butt-join the wing halves and secure them with tape cemented around the joint. This attachment method is a common practice, but I also added a plywood dihedral brace to the center of the main spar before applying

SPECIFICATIONS

Model: Super Decathlon

Manufacturer: House of Balsa

Type: sport-scale aerobat

Wingspan: 47 in.

Wing area: 329 sq. in.

Fuselage length: 29 in.

Weight: 24 oz. (2-channel); 27 oz. (4-channel w/miniservos)

Wing loading (actual): 11.8 oz./sq. ft.

Power req'd: .061 to .10 2-stroke

Power used: Norvel BigMig .061

Price: $54.95

Features: die- and laser-cut parts; full-size plan; hardware package; construction manual; decal sheet.

Comments: this is a good-looking and good-flying airplane. It went together fairly easily, and there were no surprises during construction. At the field, the Super Decathlon is a solid flyer with smooth flight characteristics.

Hits

- Nice wood selection.
- Good laser and die cutting.
- Good instruction manual.
- Straightforward construction.

Misses

- Hardware supplied for only 2 channels.
- No top view on plan.

FLIGHT PERFORMANCE

• TAKEOFF AND LANDING

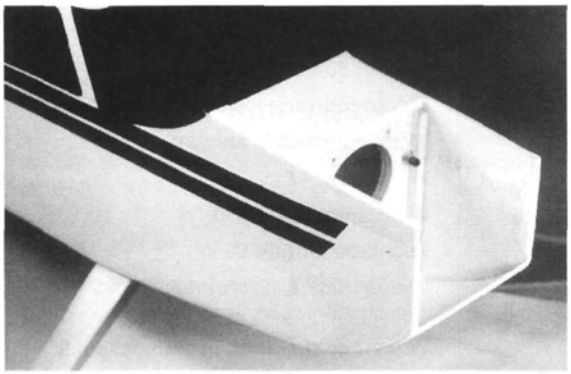
Flying the Super Decathlon is—in a word—easy! The initial flights were smooth from the start as the airplane tracked straight down the runway and lifted off gracefully. Turns in both directions using ailerons only were nice with no obvious yaw. Turns with rudder only showed some tail wag but were not that bad. Elevator response was just a tad quick, but I got used to it in less than a minute. Landings are best with a little power, and 3-point landings are very satisfying. On three occasions, landings were made in fairly tall grass with the expected nose-over, but there was no damage. A nice smooth runway would have been much better. On grass fields, a hand launch is best and is very easy to do.

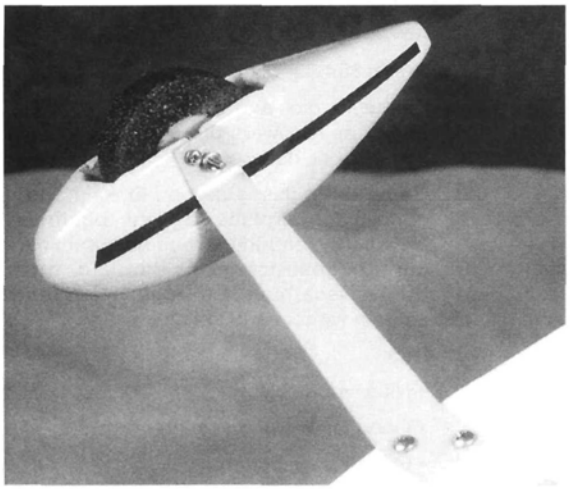
• GENERAL FLIGHT CHARACTERISTICS

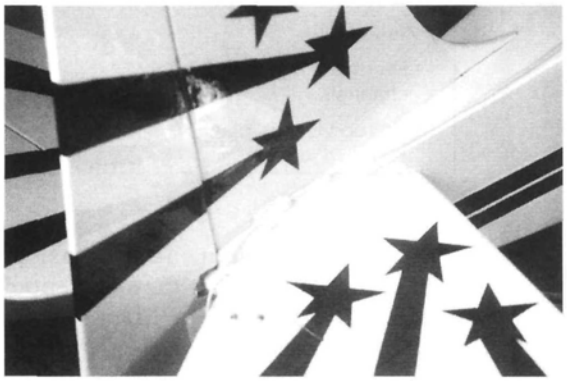
Up to a point, the Super Decathlon will slow down nicely and still have good three-axis control, but just a little below that point, and down goes a wing! I found that anything more than ⅓ throttle would cause the airplane to climb instead of maintaining slow flight, and more elevator in that configuration resulted in a snap, which was expected. Full-throttle flight is smooth and solid.

• AEROBATICS

With the .061, the aerobatics were limited to those expected of a trainer. Loops, rolls and snaps were all nice, and the addition of rudder along with ailerons made the rolls very pretty indeed. The model was definitely not happy inverted, however, so I have not tried any outside work. With a little more power, all maneuvers—including some outside ones—should be possible.







Top: the firewall was drilled with a 1¼-inch hole saw to accept the JK Aerotech Slickmount. The mount uses a 35mm film canister for the tank. The throttle line is visible on the right of the hole. Center: it's a good idea to paint the landing-gear legs before you assemble the wheels and pants. Note the small wood screw that keeps the pants properly lined up on the gear legs. Above: for years, I have used a small piece of inner Nyrod as an antenna guide. This one is epoxied right to the MonoKote covering after being pierced in several places with a pin.

the sheeting. This may not have been necessary, but it made me feel better.

I then trimmed the ailerons to shape and set them aside for installation after the airplane had been covered.

BUILDING THE FUSELAGE

Each fuselage side is made by gluing a top and bottom piece together, then adding a plywood nose piece. The two sides are not the same and are labeled "left" and "right"; it is important that you pay attention to these designations during assembly. The cabin formers are glued to the inside of one fuselage side. A gauge that's included in the kit allows you to accurately position the formers. When the glue has set, add the second side. The next step is to pull the tail together and glue the laser-cut bottom sheet from the aft cabin former, between the fuselage sides and all the way to the tail. This almost guarantees a straight fuselage!

The next step is to add the aft cabin formers and the firewall. Because I intended to use the dandy JK Aerotech* Slickmount for a tank as well as an engine mount, I drilled a 1¼-inch hole in the firewall at the proper location. Because I used the Slickmount, I didn't need to make a hatch above the tank, thus simplifying the sheeting that was to follow.

Because I intended 4-channel operation, I added additional Nyrods for the rudder and throttle. After I added the landing-gear mount and the Nyrod guides, I added the laser-cut bottom sheeting between the fuselage sides in the same way as the top sheeting. Cross-grain sheeting above and below the firewall finishes the fuselage, which is now ready for sanding.

TAIL CONSTRUCTION

Because the tail assembly is entirely laser-cut from sheet balsa, the only actual building is to cement the tips on the fin and stab and join the elevator halves via a hardwood carry-through.

When all the glue has set, a light sanding removes any glue residue around the joints. Some time ago, I made some tools by drilling holes of various sizes in pine blocks, sawing them down the center and lining the half-moon holes with sandpaper. A few quick passes with one of these tools generated nice, round leading and trailing edges in no time at all.

RADIO INSTALLATION

Plywood bearers are supplied, and radio installation was straightforward. I had to use a few extra Nyrods for throttle and rudder control. I used 15-year-old Kraft miniservos (KPS-18s) that still worked flawlessly! The aileron servo is mounted on the side of the wing center—a practice I do not prefer, but I did promise to follow the instructions! With four RC channels, a Norvel* BigMig .061 on a Slickmount and a 500mAh battery pack, the finished weight was 27 ounces ready to fly—a tad heavier than I expected.

COVERING AND FINAL TOUCHES

I tried to copy the box picture as closely as I could and settled on Cub yellow and white MonoKote* with dark blue for the trim. The most time-consuming job was cutting out 18 stars of different sizes from the blue MonoKote! Even with a heavy cardboard template, it took a while. (Boy, it sure would have been nice to have had star decals!)

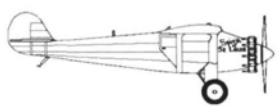
After I had mounted the tailwheel on the fuselage, I hinged the tail surfaces and added the control horns. Then I removed the covering from the areas to be glued and epoxied the tail surfaces into position. I used the bottom of the fuselage, flat on the bench, to line up the stab/elevator and a square to align the fin/rudder.

After building the wheel pants out of die-cut parts, I painted them and the aluminum gear legs Cub yellow. A blue MonoKote stripe on both sides of each completes the trim.

CONCLUSION

The House of Balsa Super Decathlon kit produces an airplane with flight characteristics that match its good looks. The instruction manual is well-written, and the supplied hardware package and decal sheet were minimal but adequate. Construction is straightforward, and the laser- and die-cut parts fit accurately. If you're looking for a small, sport-scale aerobat that's fairly easy to build, give the Super Decathlon a try.

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.* ✈



MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

An aerobat with attitude

KYOSHO

SenSation 1400 ARF

by Craig Trachten

SPECIFICATIONS

Model: Sensation 1400

Manufacturer: Kyosho

Type: aerobatic/pattern

Length: 51 in.

Wingspan: 55 in.

Wing area: 558 sq. in.

Weight: 5.75 lb.

Wing loading: 23.75 oz./sq. ft.

Engine req'd: .32 to .46 2-stroke, or .52 to .70 4-stroke

Engine used: O.S. .70 Surpass

Prop used: APC* 13x6

Radio req'd: 4-channel with 5 servos

Radio used: Futaba* 8UAP

Street price: $249.99

Features: all-balsa construction, 8-color covering scheme, prepainted fiberglass cowl and pants, full hardware kit included.

Comments: I have built many ARFs, and this one is the king.

Hits

- Impressive covering scheme.
- Well-built subassemblies.
- Easy to assemble.
- Great flyer.

Misses

- A few wrinkles in the covering (easily remedied).

Many modelers who buy Kyosho* kits have high expectations of quality. And, without fail, Kyosho delivers; flawless fit and finish, clear instructions and solid performance are the company's trademarks. The Kyosho Sensation 1400 not only meets these expectations, but it beats them, too. This airplane is constructed of the highest-quality materials, and it comes covered with a radical trim scheme. If you paid someone to duplicate Kyosho's covering job, it would probably cost more than you paid for the entire kit. The vivid graphics will certainly draw spectators' attention at the flying field.

OPENING THE BOX

The kit comes with a fiberglass cowl and wheel pants plus all the hardware needed, including the landing gear, wheels and fuel tank. The covering might be a bit wrinkled because of temperature variations, so start by smoothing it out. The kit I reviewed had only a few wrinkles, and a light once-over with a heat gun took care of them. Just to be safe, I applied my iron to

PHOTOS BY WALTER SIDAS

the seams at the wingtips and roots to make sure they were tight. You may want to direct your iron to the areas over the hatches on the undersides of the wing halves to ensure a tight bond before you cut away the covering.

Begin construction of the Sensation by attaching the ailerons to the wing halves. The ailerons are secured with the supplied CA hinges. A CA pipette with a fine tip affords the best results when pinpoint gluing is required. It's a good idea to have debonder close by just in case you make a mistake. The documentation does not specify which type of epoxy to use. My choice was 30-minute epoxy for everything, except on the wing roots; there, I used 2-hour epoxy. I enjoy the luxury of an extended work time and a stronger bond.

FLIGHT PERFORMANCE

by Rick Bell

Because of other obligations, Craig could not make the first flight. I was given the honor, and after a thorough preflight check and some minor engine adjustments, we were ready to go.

• TAKEOFF AND LANDING

I made a few taxi runs up and down the runway to get a feel for the ground handling and to see whether the wheel pants were going to be a problem. The throttle on the big O.S. Surpass was slowly opened, and the Sensation was quickly airborne at about ½ throttle. After a few trim passes around the patch, straight and level passes were the order of the day. Landing the Sensation holds no surprises; just line it up, hold a little throttle and it just about lands itself—very solid on final approach.

• LOW-SPEED PERFORMANCE

Because the Sensation is so clean, it takes a while to slow down after the throttle has been cut. Once slowed down, the Sensation is very solid, with no nasty snapping habits. Stalls were straightforward; after the nose dropped, application of power quickly had it flying again.

• HIGH-SPEED PERFORMANCE AND AEROBATICS

"Arrow-like" best describes the tracking at speed. Using the recommended low rates, I found handling smooth and easy. FAI-type aerobatics were fun and easy to do. Loops were as pretty as could be, and rolls were axial, to say the least. Point rolls and knife-edge flight were also easy to accomplish, and inverted flight was as easy as upright. The Kyosho Sensation would make a "sensation"-al pattern trainer! Try one; you'll see what "smooth" means!

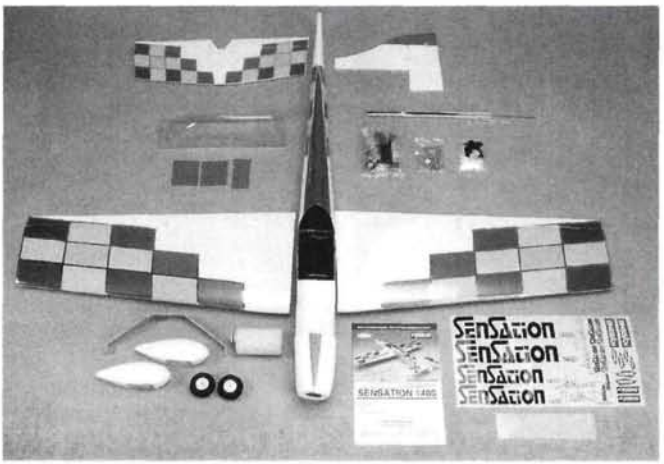
Before you join the two wing halves, remove the covering over the servo hatches. I cut out a small, square hole in the center of the opening, then slit the covering from the corner of the hole to the corner of the hatch opening. With my covering iron, I then tacked the covering down into the hatch. This procedure reduces the chances of the covering's lifting around the hatch.

Continue by epoxying the wing-joiner pieces together and then epoxying the wing joiners into one wing half. Now epoxy the wing halves together. It's a good idea to wrap the wing root with ½- to ¾-inch masking tape. Any epoxy that oozes out when you join the wing halves will end up on the tape and not on your wing. Remove excess ooze with isopropyl alcohol. To finish wing construction, attach the front wing-mounting dowels and rear mounting plate. The instructions call for epoxy for these steps, but I used CA gel. Drill a pair of 4mm holes for the wing hold-down screws and insert them.

It's time to install the aileron servos. I first secured the servo-mounting blocks to the ears of the servo, then I epoxied the assembly to the servo hatch. One of those pistol-grip bar clamps works well for holding everything in place until the epoxy has cured. Feed the servo wires to the exit holes and secure the hatches to the wings with four screws. Attach the horns to the ailerons, then attach the linkage rods between the servo and horn.

The next tasks are to install the engine and fuel tank. Instructions are supplied for installing both 2- and 4-stroke engines. Follow the steps applicable to the engine of your choice. I mounted an O.S.* Surpass .70 simply because I prefer to use 4-strokes. The included fuel tank is the three-line variety. When I use a three-line tank, I use dual clunks instead of the traditional one clunked line and one brass fill line. Clunking the second line makes it easier to de-fuel the aircraft. To help distinguish between the lines and prevent confusion, I use fuel tubing of various colors for the carb line, pressure line and fill line.

The O.S. .70 Surpass engine provided ample power for spirited aerobatics.

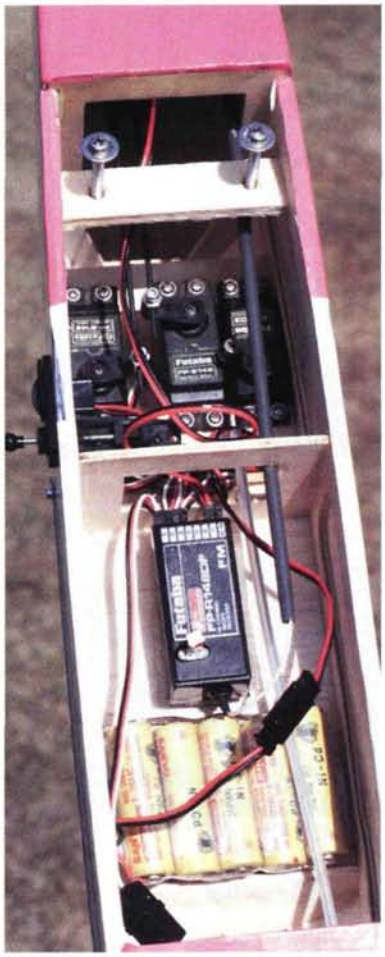


Included in the kit are the covered wings and fuselage, canopy, cowl, wheel pants and all the hardware you see here.

The empennage is attached as on any other ARF. First, trial-fit the horizontal stab and rudder, and mark their positions. Remove the covering from the area that will be epoxied, then epoxy the tail feathers into place. Have some alcohol and paper towels handy to wipe away any ooze. CA the elevator and rudder into place, and you are ready for servo installation. Install the servos

configured as shown in the instructions. I am not an aggressive pilot, so standard servos are sufficient for my flying style, but if you want to take this aircraft to its limit, go for high-torque servos.

The supplied pushrods must be assembled. They are composed of hardwood dowels, wire and shrink tubing. They are relatively easy to construct, and they performed well. If you are an aerobatics flier, consider using fiberglass rods such as Dave Brown's* no. 5400. The most difficult part of the installation is getting the pickle-fork end of the pushrod through the fuselage. I feed chases in from the tail toward the radio compartment; place each end of the fork into a chase, then push. The fork will compact and follow the chase right out the rear. Attach with clevises and keepers, and you are on your way to the final stretch.



Radio installation is uncluttered, and it's easy to access the gear.

Trim the canopy in preparation for installation. The straight cuts are easy, but cutting a curve can be a pain. I use Hobbico curved-tip canopy scissors. In my opinion, this aircraft is too pretty to go pilotless, and a nice, scale pilot would be the coup de grace. Like most people, however, I don't practice what I preach; I chose "Crash Bandicoot" as my pilot.

To install the main landing gear, start by drilling four, 2.5mm holes in the landing-gear block. Secure the one-piece aluminum strut with 3x25mm screws. The wheels and pants are a snap to secure. The wheel pants are fiberglass with molded-in recesses for the struts. There is no guesswork here regarding whether the pants are at the correct angle. Follow the construction diagram, and you'll be ready for smooth landings.

At this point, I installed my receiver and battery, even though the instructions suggest cowl installation as the next step. I always install the cowl last. I fired up the electronics and took care of all my setups and adjustments. I used the factory-recommended setting on high rate and 75 percent on low. I softened up the sticks with -25 on ailerons, -20 on elevator and -15 on rudder. As I become more familiar with the aircraft, I will fine-tune these settings.

At this point, I installed the cowl. I usually save this step for a separate night so that I am fresh when I start out. My night starts with measuring: I mark the cowl, see whether it fits, and trim off just a little. I repeat this several times and work very slowly so I achieve a perfect fit. Depending on the cowl, cutting and installing can take anywhere from 1 to 3 hours. This one took me about 2 hours.

CONCLUSION

The Sensation kit lives up to the discerning modeler's high expectations. With clear instructions and high-quality subassemblies, the kit is a cinch to put together. Because the Sensation comes covered, one of the most difficult and time-consuming steps in RC aircraft construction is eliminated. This kit is simple enough for a beginner's first foray into RC aircraft yet satisfying enough to be enjoyable for the experienced builder. The Sensation lives up to its name.

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.* ✦

IMAC Aerobatics

by Dan Wolanski

The Spin

A basic maneuver for IMAC competition, the spin requires that the model be stalled before entry.

In International Miniature Aerobatic Club (IMAC) competition, the spin is first flown in the basic sequence. It's a maneuver in which the aircraft autorotates about a stalled wing panel as the opposite panel continues to generate a little lift while the aircraft descends vertically. Spins may be done deliberately or inadvertently (during another aerobatic maneuver).

Keep in mind that snaps and spins are very similar in that both are autorotational maneuvers in a stalled condition, but snaps are much shorter in duration and usually end with the aircraft's following the initial direction of flight; with spins, the aircraft remains stalled and heading straight down.

To spin an aircraft, you must first stall its wing. Enter a proper upright stall by gradually reducing the throttle to idle and inputting up-elevator to maintain the same altitude (see Figure 1). The plane should not gain altitude during this segment, but its nose must rise as airspeed is decreased. When the airplane reaches the stalling point, it will drop its nose while flying horizontally, usually led by one wing that's slightly lower than the other.

To spin the aircraft, you must input full aileron and rudder in the direction of the lowest (stalled) wing and then hold it along with full up-elevator. Hold these inputs for approximately ¼ to ½ a rotation before the desired stop point. To stop the rotation, simply bring the sticks to neutral (center).

After the plane has stopped spinning, it must descend with its nose pointing straight down so that it gains sufficient airspeed to build up for recovery. Once flying airspeed has been attained, apply up-elevator for an upright recovery back into straight and level flight.

The spin may seem easy to understand, but I have seen three planes crash at competitions because their pilots failed to follow proper recovery procedures. How do I know that it was pilot error? Because in every case, the pilot approached me after the crash and asked how he should recover from a spin, and every one had entered the spin with insufficient altitude. After completing the designated rotations, these pilots panicked and continued to hold up-elevator, hoping to fly the airplane out of the maneuver. In a spin, the only thing up-elevator does is to ensure that the wing remains stalled. In no circumstance should you use up-elevator to recover during a spin. You *must* allow the plane to gain airspeed in an unstalled condition before you apply elevator. This means that you have to center the sticks and let the model point straight down to gain airspeed.

VARIATIONS

• **Inverted spin.** First introduced as part of IMAC's advanced sequence, this is a more difficult maneuver. You enter from an inverted position and have to stall while inputting down-elevator. When the wing stalls, you must input and hold full aileron, opposite rudder and down-elevator to generate a spin. You need opposite rudder because the plane is inverted and the yaw aerodynamics are reversed. Recovery is the same as for an upright spin.

• **Cross-over spin.** Seen only in the Tournament of Champions (TOC), Masters World Aerobatic Competition and selected Unlimited IMAC sequences, the cross-over spin is the most difficult spin to accomplish. It's entered in the same way as a typical spin, but after the stall, it requires inputs for a reversed entry. For example, to enter a cross-over spin from an upright position, you stall the aircraft with up-elevator. When the wing stalls and the nose falls through horizontal, you must input down-elevator, full aileron (in the direction of the stalled wing) and opposite rudder (from the aileron) to induce a sort of

An inverted spin is entered from the inverted position and requires down-elevator and opposite rudder.

negative spin from upright. These spins often look funny during their initial development, and they are difficult to judge.

• **Flat spins.** These are not considered to be precision aerobatics but they're nonetheless fun to fly. Planes differ with respect to how they flat spin. A flat spin starts like a typical spin; then you add a little throttle while easing out aileron. How much throttle and aileron you need varies greatly and will be governed by the type of aircraft you fly and by its wing loading.

Pilots sometimes use full opposite aileron for really spectacular flat spins. Keep in mind that you must input opposite aileron slowly or you may cause the model to stop spinning. Many planes also require a lot of rudder and elevator-surface deflection to accomplish a flat spin.

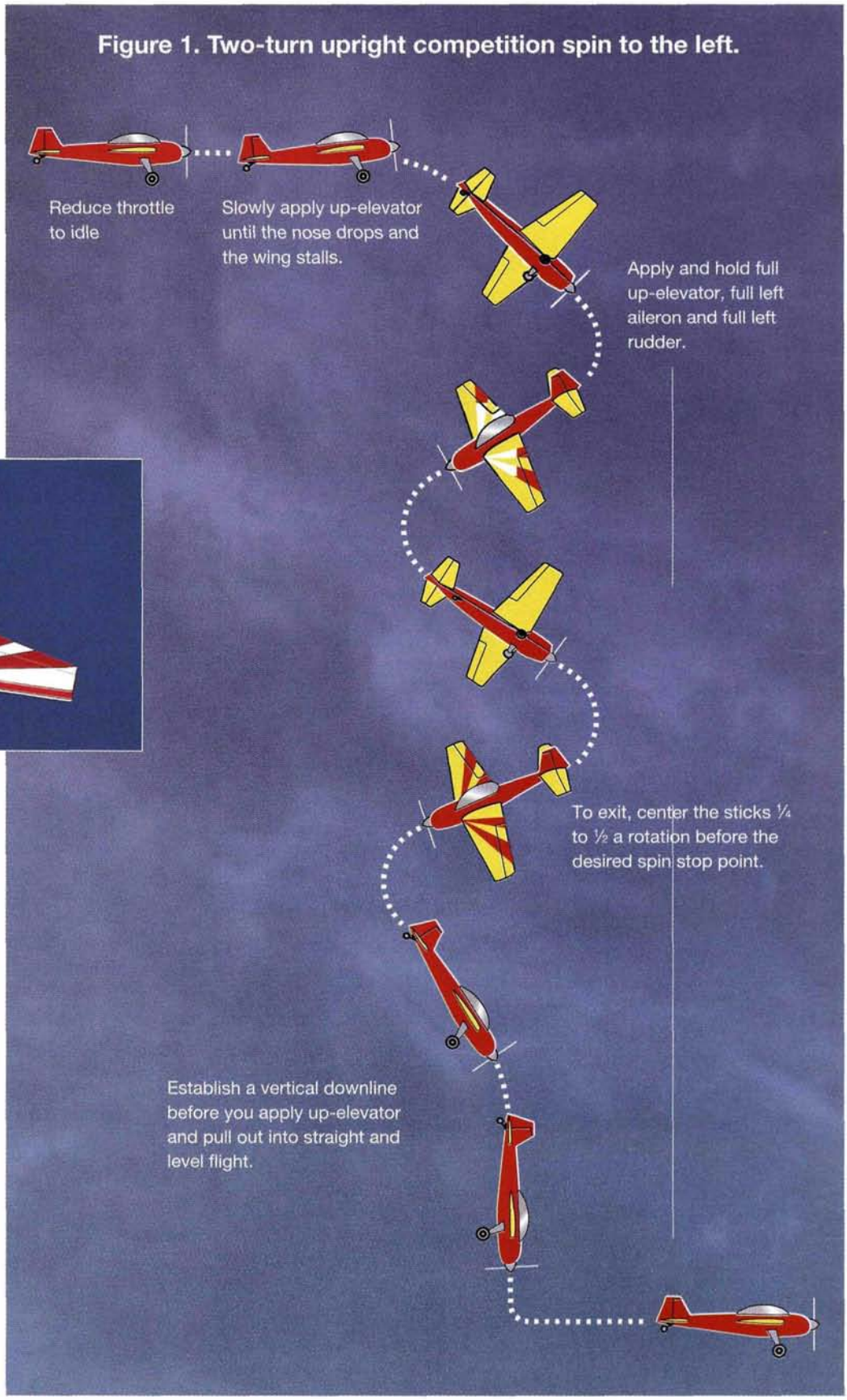
To recover from a spin, the model's wing must be unstalled. This means that the model must stop spinning and point straight down to gain sufficient airspeed.

Recovery is usually the same as when doing an upright spin, but I have seen flat spins continue even after the sticks have been brought to neutral. When this happens, throttle must be added and, in some cases, opposite rudder will be needed to stop the plane from flat spinning all the way to the ground. Keep this in mind if you decide to try this maneuver.

• **Knife-edge spin.** This is a very difficult freestyle TOC and Masters maneuver and should be attempted only by experienced pilots. It requires huge rudder and elevator-surface deflections (45 degrees). After entering the spin inverted and stalled, input full down-elevator, full aileron and the same direction rudder while increasing throttle slightly. The throttle develops and maintains the spin. Too much throttle and the model will fly out of the maneuver; too little and the spin won't develop properly. Recovery is accomplished by centering the sticks and praying that your model will come out of the maneuver!

Now that you know all about spins, go out and have some fun trying them. But be sure you know how to get out of a spin before you attempt one, or you could end up with a bruised ego and a more severely damaged model! ✈

Figure 1. Two-turn upright competition spin to the left.



Send in your event coverage. Mail photos, captions and text (500 words or less) to "Grassroots," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. Color slides and prints are acceptable.

Warbirds over Orlando

The World Miniature Warbird Association (WMWA) is one of the USA's fastest growing special-interest groups, and it is rapidly becoming the international organization that its name already suggests that it is. This group endorses the building and flying of RC planes of all sizes and types and stipulates only that they be scale and painted in military colors.

The R/C World Flyers' 1st Annual Warbirds Over Orlando three-day fly-in was highly successful. It started on Friday and ended on Sunday with the presentation of awards.

Contest director Sal Battaglia was ably assisted by Dixie Cutrone and yours truly, Wally Zober.

The 68 registered pilots brought 93 airplanes of all sizes and types, including WW I "pursuit ships" (as fighters were called in that era), heavy-metal WW II fighters, bombers and turbine-jet-powered models.

The R/C World Flyers have a unique and highly coveted flying site that includes a lake for float flying and an air-conditioned clubhouse flanked by pit areas. The clubhouse and its garage are used for storage and overnight battery charging. There's a paved 490x50-foot main runway alongside a close-cut grass runway that accommodates WW I and WW II tail-draggers.

The weather was really great—partly sunny skies, comfortable temperatures (78 to 82 degrees), low humidity and a gentle breeze straight down the runway.

At all times, four airplanes were in the air, but noise wasn't a problem. From the smallest glow-powered model to the giant-size gas burners, these warbirds were relatively quiet, and this elicited many favorable comments. The turbine-powered jets were the quietest.

One of the spectators asked me: "Why are men so fascinated with model warbirds?" After thinking, I asked, "Have you ever seen the movie, 'The Secret Life of Walter Mitty'?" I explained that Mitty—an average guy with

Doug Smith won the Best WW II award for this beautiful 140-inch-span, 54-pound (dry) B-17G bomber; four Zenoah G-23 engines; Robart retracts. A smoke generator on one engine gives an "engine-out" effect. The big bird has logged 72 flights and was built by Rob Rabideau.

Hank Likes (producer of Hank's landing gear), campaigned his giant, 1/3-scale Piper Vagabond. It has a wingspan of 10 feet, weighs 24 pounds and is powered by a Quadra .52 engine turning a 22x10 prop.

You have to hear this 4.5ci engine run! It purrs like a kitten as it turns a 22x14 prop at 6,000rpm.

Built from Bill Northrop plans, Ray Williams' pretty, scale Gypsy Moth biplane is unique because it has a handmade, 4-cylinder, in-line engine designed by Merrit Zimmeb.

The Best Post-WW II award went to Joe Grable for his outstanding, beautifully crafted and great flying Hercules C-130 done up in the U.S. Coast Guard's color scheme. Its wingspan is 139 inches, it's 98 inches long and 40 inches high. It's hard to believe that it weighs only 43 pounds dry. Power comes from four Saito .91 engines turning 14x6 APC props.

a very quiet, uneventful lifestyle—frequently used his extraordinary imagination to fantasize that he was a different person. A favorite fantasy was of being a fighter pilot. I went on to explain that when some of us fly our RC warbirds, we fantasize that we are Capt. Eddie V. Rickenbacker, or Baron Manfred von Richthofen, or maybe even Chuck Yeager. We love the adrenaline rush we get when flying these warbirds.

If your life could use an adrenaline rush, check out the World Miniature Warbird Association's website at www.aero-sports.com/warbirds/wbhome.html.

Till next time: stay well and keep 'em flying!

With his big, twin-engine, hot-dogging P-38 Lightning, Arnold Marcus burned a lot of holes in the sky. The model is powered by two Brison 3.2 Sachs Dolmar engines spinning 20x12 carbon-fiber, 3-blade props; Robart retracts; 5½-inch Du-Bro scale wheels.

One of the three models Bill McCallie brought to the fly-in: a Yellow Aircraft Japanese Zero powered by an Enya VT-240 twin; 19x10 Mezlits prop; finished in Super Epoxy.

Pat McCurry built his beautiful, 1/5-scale ME-109G from a Dave Platt kit. It's powered by an O.S. 1.08 turning an 18x8 prop.

Tom O'Bringer's L-4 comes in for a landing while fighting a crosswind.

Rich Feroldi earned the Best WW I award for his outstanding,118-inch-span Albatross DV. It's finished in the low-visibility color scheme ordered by Manfred von Richthofen for the full-size aircraft and is powered by a Sachs Dolmar 5.8 engine swinging a 24x12 prop.

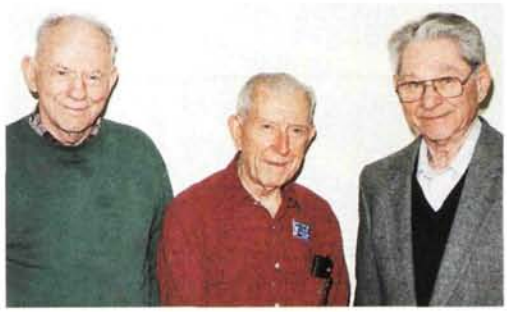
PHOTOS BY WALLY ZOBER

IN THEIR OWN WORDS

Three pioneers reminisce about the early days of RC

by Frank Gudaitis

In February 1996, at the Westchester Aero Modelers (WRAM) show in White Plains, NY, I met with three distinguished pioneers of model aviation: Joseph Kovel, Benjamin Shereshaw and Henry Struck. Armed with a tape recorder, I was able to record some of their memories of the early years of the hobby. Here are their stories.



Model aviation pioneers Henry Struck, Joseph Kovel and Benjamin Shereshaw at the WRAM show, February 1996.

JOE KOVEL AND THE K-G

"I started to build model airplanes right

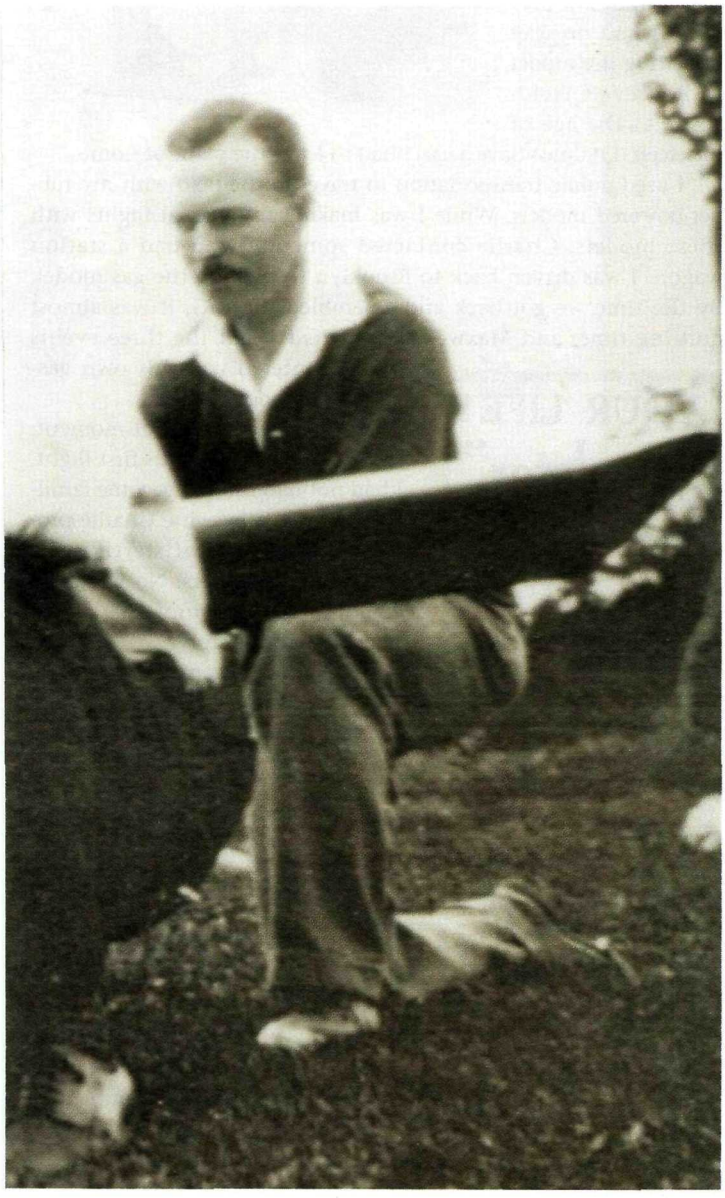
This is the only photo taken of the full K-G team. Left to right: Joe Kovel (builder of the model), Bill Brown (designer and builder of the famous "Brown Jr." engine) and Charles H. Grant (designer of the model). This photo was taken just after the original K-G 1 made its first successful flight from a field in Landgrove, VT, on Labor Day weekend in 1933.

after Lindbergh's flight to Paris in 1927. The first model was a 'standoff' scale of Lindbergh's airplane. The framework was made of pieces of wood split from the egg crates that were available to us in those days. I used Le Page's glue and window-shade material for covering. There was no rubber motor and no prop. I fastened a long string under the fuselage, and I ran with the model until it took off.

"The second model I built from plans published in *American Boy* magazine. It was a stick model with a wingspan of about eighteen inches. When hand-launched from shoulder height, it flew for about 'one sewer' length—the distance between two manholes in our street.

"The third model was built from plans in

Joe Kovel and Charles Grant with the K-G in Vermont, 1933.



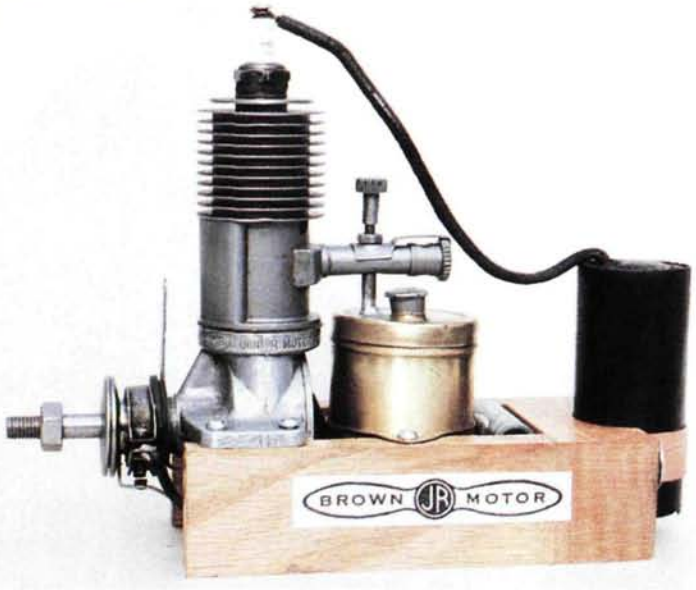
PHOTOS BY FRANK GUDAITIS

A few years later, the K-G is still flying. Joe Kovel fills the gas tank of the K-G gas model during subsequent flights in Vermont.

Popular Science magazine around 1928. This model proved to be a great success.

"It was a pusher model with a cigar-shaped fuselage, and it had a landing gear. It actually took off under its own power and climbed to a height of about twenty-five feet.

"After that, I began to design my own models, and I had a fair measure of success in local contests around New York



Bill Brown's "Brown Jr." engine, .60ci displacement. At $21.50, it was an expensive proposition for young modelers during the Depression.

City. These contests were frequently sponsored by local newspapers and were held in various armories for indoor events, and in Van Cortland and Central Parks for outdoor events.

"At the Atlantic City Nationals in 1932, my model won the 'Stout' indoor stick event with a flight of thirteen minutes, three seconds. This event was held in one of the hotel ballrooms. I think it was the last time that a paper-covered model won that event at a Nationals. It was here that I heard that a fellow named Maxwell Bassett had successfully flown a gasoline-engine-powered model airplane. This was to foreshadow my own entry into gas-powered models.

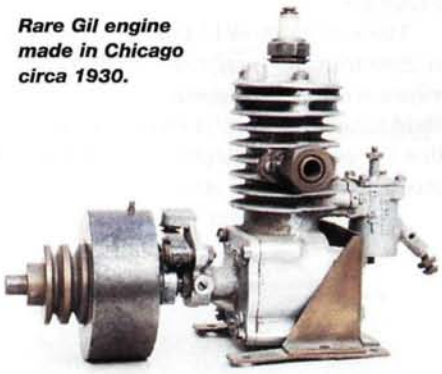
"The K-G story began in 1933 when I received a postcard from *Model Airplane News* notifying me that a medal I had won at a recent contest was available for me to pick up. When I arrived at their offices, a secretary told me that Charlie Grant, editor of *Model Airplane News*, had a visitor, but that I could go right in. The visitor was Lt. H.W. Alden of the National Aeronautic Association [NAA]. I knew him from the many contests I had attended at which he officiated in one capacity or another.

"As I walked into Charlie's 'inner sanctum,' Lt. Alden said to Charlie, 'How about Joe, Charlie? Have you asked him?' I had no idea what they were talking about. Then Charlie asked me, 'If I were to furnish you with a gasoline engine, would you be willing to build a model airplane for it?' I hesitated for an instant while the impact of Charlie's question hit me. Would I be willing to build a model airplane to be powered by a real gasoline engine? How could I say no?

"Though I had graduated from high school and was attending night school to gain the credits I would one day need to take a course in engineering, the thought of building a gas-powered model promptly took first priority. The Nationals were to be held within a few short weeks at Roosevelt Field, New York. Over the next few days, I cleared the decks for action by completing the rubber-powered models I intended to fly at the Nationals while Charlie drew up the rough plan of the gas model on heavy brown wrapping paper.

"I still find it hard to believe that I completed construction on what was to be called the K-G—for Kovel-Grant—three weeks after I received Charlie's rough drawings. The model was finished on the morning of the first day of the Nationals. It was a large model with a wingspan of eight feet and a fuselage more than six feet long. I had no way of getting the model to Roosevelt Field, since, at the age of nineteen, I did not have a car. I had to leave the plane at home.

Rare Gil engine made in Chicago circa 1930.



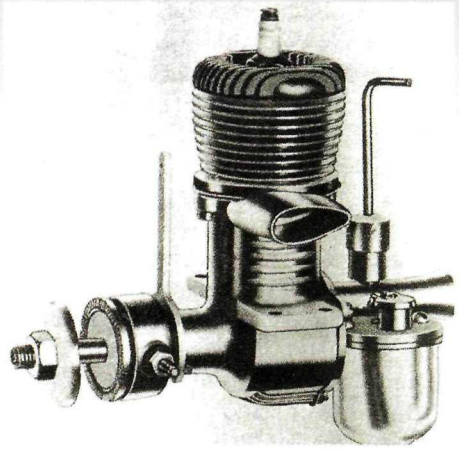
"I used public transportation to travel to the field with my rubber-powered models. While I was making my official flights with these models, Charlie contacted someone who had a station wagon. I was driven back to Brooklyn to pick up the gas model. By the time we got back and assembled the K-G, it was almost quitting time, and Maxwell Bassett had swept the three events he had entered with his own gas-powered model.

"Now came the crucial moment: starting the engine for its first flight. I had not had time to become familiar with the Gil engine Charlie provided, so the job of starting the engine fell to others. No luck! We could not get it to run! That ended phase one of the story.

"Phase two began when the K-G and I were shipped to Grant's home in Peru, Vermont. By then, the engine Charlie had obtained from Bill Brown had arrived. Charlie had designed a special engine mount, and I modified the fuselage so that it was able to receive the powerplant as a complete unit that included the engine, fuel tank, ignition coil, condenser and batteries.

"Bill Brown arrived on Labor Day weekend, 1933, to help with the first flights of this model. We took it to nearby Landgrove, assembled it, and Bill Brown started the engine. Charlie Grant picked up the model and launched it into the air. He had to hand-launch it because the grass—fortunately—was about three feet high. The model went up to a

Advertisement for Ben Shereshaw's "Loutrel Speedster." The first gas model available as a kit, this sleek-looking ship sold for $8.



Ben Shereshaw's masterpiece: the 1939 Bantam Class A engine—winner of three consecutive Nationals plus countless other victories.

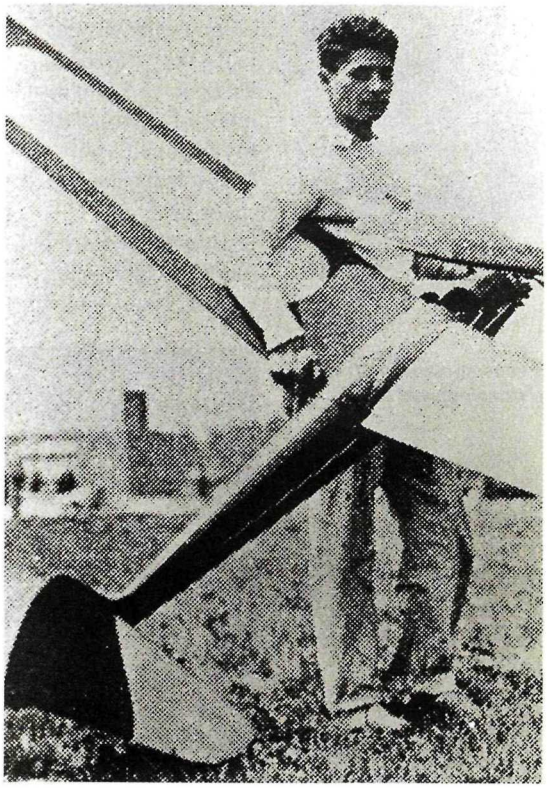
height of perhaps fifty feet, made a shallow bank and slowly spiraled into the ground, breaking the prop. Prop number two was installed, Charlie made a few adjustments, and the model was hand-launched again. It repeated its previous performance. Prop number three was installed, and Charlie made more adjustments. Again the model repeated its slow spiral into the ground, breaking the third prop. At least its performance was consistent! With no more props on hand, we went back to the shop and to the drawing board.

"While Bill Brown and I were each carving another prop, Charlie did some heavy thinking. He decided to raise the wing three inches to raise the center of gravity and the center of lateral area. I built the new wing mount per Charlie's instructions, and then we went back to Landgrove for further flight tests. Charlie again ran with the model, launched it, and away it went into a beautiful climbing turn. Success! On its first flight, the model was timed for fourteen minutes. It was subsequently found by Charlie on the forest floor, undamaged, with a twig caught in its landing gear. We had lots to talk about at dinner that night.

"The design of the eight-foot K-G 1 was refined, and the ten-foot K-G 2 made its appearance in 1934. One year later, at the Eastern States contest at Hadley Field, New Jersey, it made a record flight of sixty-four minutes, forty seconds. During this flight, it went out of sight at about three thousand feet.

"The K-G was the first inherently stable gas-powered airplane model on all three axes, with power on and power off. In 1935, Joe supplied detailed hand-drawn construction drawings of the K-G, together with building instructions. These were published in the April and May, 1935, issues of *Model Airplane News*. Reproductions of these drawings are still available today from the magazine."

After 11 years of night school, Joe earned his engineering degree and spent many years working in the aviation industry at companies such as Sikorsky, Seversky, Brewster and Edo. Today, the original K-G has been proudly hung in the AMA Museum in Muncie, Indiana. Joe has built a replica of his original K-G, and with the assistance of RC, he flies it at old-timers' meets.



Ben Shereshaw and his Custom Cavalier, circa 1936. The Custom Cavalier was one of the greatest contest winners of all time!

BEN SHERESHAW: AEROMODEL ENGINEERING IN THE '30s AND '40s

As a very young man, Ben was walking through the Sheep Meadow in New York City's Central Park one day when he saw a model airplane flying very smoothly and silently at an altitude of about 20 feet. It was a rubber-band-powered twin-prop pusher with a triangular configuration.

The impression it made on him stayed with him for the rest of his life, and he has contributed to the hobby in many beneficial ways. Conditions were primitive in the earliest days of model aviation; there were no hobby shops where model-building supplies could be purchased. Ben and other early modelers had to improvise and use whatever materials they could find to scratch-build their models.

Ben built many rubber-band-powered models and won contests that in those days were sponsored by several metropolitan area newspapers. His work with rubber power led him to gasoline power.

By the early '30s, the first small gas engines were starting to appear on the scene. In 1935, using the new high-powered Loutrel engine, Ben designed a 7-foot-wingspan model called the Loutrel Speedster. It was the first gas model to be offered for sale in kit form, and it sold for $8.

Several relatively large gas-model designs followed, including an early attempt at radio control. Unfortunately, in those days, radios required vacuum tubes and heavy batteries. The challenge faced by designers was to build models that were large enough to carry this heavy radio equipment. Ben's answer was the RC-1. It was a large pusher with a 10-foot wingspan and a gross weight of 15 pounds. The RC-1 marked another breakthrough for Ben: it was the first RC gas model sold in kit form.

In the wake of his success with aircraft, Ben decided to build his own engines. He set up a small lathe and drill press in his living room, much to the consternation of Mrs. Shereshaw. By the time he learned to master these machines, several engines of larger displacement had become available—most notably, the Brown Jr. engine.

Ben turned his attention to the design of small engines. A problem faced by early modelers was how to transport models to contests, as few modelers had cars at that time. You couldn't just carry a plane with an 8-foot wingspan onto the bus or subway! Smaller models, however, *could* be carried onto public transportation. Such were the conditions under which Ben developed his class-A engine while at the same time designing one of the first class-A kit planes: the Baby Eaglet, which was sold by the Scientific Model Co.

Ben's first successful small engine was the Bantam .16. It slowly came together in his cellar workshop during 1937 and '38. This first engine was the winner in class A at the 1939 Nationals. Ben modestly says, "Back then, it did not have much competition."

The Bantam .16 was followed in 1939 by the even hotter rotary-disc-valve Bantam .19. This engine powered the

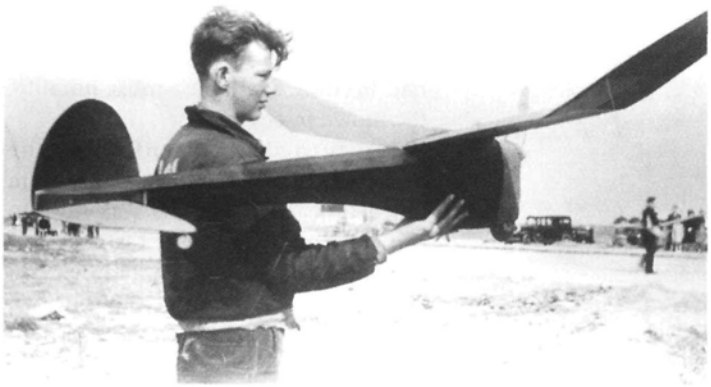
winners in the class-A Nationals in 1940, 1941 and 1946. At the 1940 Nationals, the Bantam .19 won first, second, fourth, fifth, seventh and 10th in the senior class-A event. It went on to win countless regional control-line and free-flight contests throughout the nation in the postwar years.

All model engine manufacturing ceased during WW II. When peacetime returned, model aviation took off with unprecedented growth. By 1948, there were approximately 95 model engines on the market.

In addition to continuing production of the Bantam .19 engine, Ben was an early developer of the glow plug. Two fellows by the name of Smith and Chamberlain developed a very potent fuel they called "Liquid Dynamite." With this fuel, electrical power to the spark plug could be disconnected, and the engine would keep on running.

Henry Struck with his world-record-holding free-flight speed gas model airplane, circa 1950.

To better use the new fuel, Ben cut out the points of the spark plug and replaced them with a very small coil of nichrome wire. This was one of the first glow plugs. About the same time, Ray Arden developed his own glow plug with a coil made of an alloy of platinum and iridium wire. Platinum was a superior catalyst of methanol, and today, all glow plugs are basically copies of Arden's design. Ben manufactured countless thousands of these devices. For Ben, as well as for countless enthusiasts across the country, aeromodeling had entered its golden age.



***Henry Struck at age 25 with his 1939 Nationals record-breaking free-flight gas model "Record Hound." Construction drawings were published in a 1939 issue of* Air Trails.**

HENRY STRUCK: THE EARLY DAYS OF CONTEST MODEL AVIATION

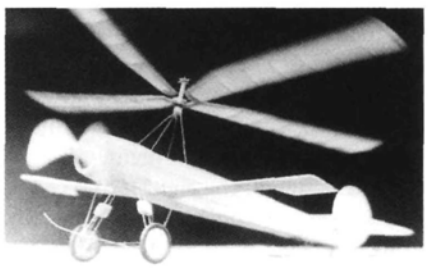
Henry Struck was unquestionably the most prolific model airplane designer, builder and contest-winner in the early years. His work spanned the range of Nationals-winning models from diminutive microfilm indoor flyers to rubber-band-powered flying scale miniatures and free-flight gas models.

Henry Struck was 10 years old when, playing ball one day in a schoolyard in Queens, NY, he looked up and saw three Douglas World Cruiser airplanes flying overhead on their way to Mitchell Field. Then and there, he lost interest in playing ball.

Not long afterward, he found the very first issue of *Model Airplane News* in a local store. It began what was to become a distinguished lifetime in model aviation.

He had the good fortune to meet Frank Zaic, who owned a small shop called "JASCO"—Junior Aeronautical Supply Co.—in a building on 15th St. in New York City, just east of the Third Ave. el. This shop soon became a meeting place for all the early model builders in the area. In addition to supplying model building materials, Frank Zaic scoured the world for the latest model airplane developments. His annual yearbooks contained much valuable information for all modelers. Henry, Joe and Ben all agree that Zaic was an inspiration to many who later became champions.

Henry's models soon started winning contests. His first win was in 1931. Several more victories brought him to the attention of *Model Airplane News* editor Charles Grant, who published more than 10 of Henry's contest-winning models, including four of his Nationals-winning scale model airplanes. In these articles, Henry was always keen to share his breakthroughs and discoveries with other model builders. Many of his designs were also published in *Air Trails, Flying Aces* and other publications of lesser renown.



***Flying scale model of Juan de la Cierva's 1924 autogyro by Henry Struck. Construction plans were published in the March 1940 issue of* Flying Aces.**

Charles Grant was also an aviation inventor who held several basic patents on various unique wing designs for full-size airplanes. During the development of many of these inventions, Grant had Henry make experimental wind-tunnel models to test their design theories.

Henry once shared a workplace with another accomplished model builder: Louis Garami, who was bitten by the model-building bug as a youngster in his native Budapest, where he once peeked

Mr. and Mrs. Henry Struck with Dr. Paul Garber and Henry's world speed record-setting free-flight gas model exhibited at the Smithsonian's National Air Museum in 1952.

Today, Joe Kovel flies a K-G replica equipped with RC!

through a fence and saw Louis Blériot flying his early monoplane. Later, as a young adult in the U.S., Louis had a radio repair business (in common with pioneering RC builder Joseph Raspante). Louis neglected his shop, however, and spent his time building models with Henry. An exceptional modeler and original thinker, Louis Garami is believed to have been the first control-line flier to have exceeded 200mph with oxygen boost.

In later years, one of Henry's free-flight gas models set a world speed record of 88mph at the Alameda, CA, naval air station. It was timed by the NAA. This particular model was one of only a few ever exhibited at the Smithsonian's National Air and Space Museum in Washington, D.C.

In recognition of his many achievements in model aviation, the AMA and the Society of Antique Modelers have both inducted Henry Struck into their respective Halls of Fame.

Henry Struck with his original 1939 free-flight gas model "Record Hound" at SAM meet in 1993.

THE ENGINEERING LEGACY OF AEROMODELING

Looking back across the years, Joe Kovel, Ben Shereshaw and Henry Struck remembered their roots as well as those of many of their contemporaries.

Ben spoke of the late Carl Goldberg. "He was a great guy; a fine, soft-spoken gentleman who was also a superb designer and builder of contest-winning models." Leon Schulman, Sal Taibi and Walter Dickinson were three more great contest winners. Leon later served as a lieutenant in the USAAF. Another fine model builder was Gordon Murray, who flew Spitfires with the Royal Canadian Air Force. Tragically, he was shot down over Malta early in WW II and died.

The wife and son of Rear Adm. William Moffett present a trophy to gas model pioneer Maxwell Bassett, circa 1934.

Nor can we forget Jim Walker, who invented U-control. Dick Korda and Henry Struck are notable modelers whom Ben has called "the greatest of the greats."

Ben considers Joseph Raspante to have been "a real pioneer" of the early days of RC. The Good brothers—Walter and William—were outstanding RC builders and early national RC contest winners. Walter later designed the proximity fuse that was widely used in WW II. Leo Weiss was another early RC model builder/experimenter who founded his own successful aviation electronics company—Avlen.

Former modeler John Glass invented the Slave-Servo motor system, which he patented. It was widely used in military and civilian applications. Maxwell Bassett, who won the very first Gas-Model Nationals, went on to become vice president of the Singer-Kearfott Corp.

In the early 1930s, Charles Grant was an aeronautical engineer who held several basic patents on full-size aircraft-wing designs. He was also, as previously noted, the editor of *Model Airplane News,* and during its first decade, he built it into the foremost model-aviation periodical. His contributions to the growth of model aviation were of immeasurable value.

The work of many model builders, though largely unsung, has enriched the engineering domain not only in this country but also worldwide, for example, Reginald Mitchell, designer of the Supermarine Spitfire—one of the great pursuit aircraft of WW II. Mitchell was also an avid model builder in his youth. At 16, he was apprenticed to an engineering firm engaged in locomotive production. He was an enthusiastic mechanic who even installed a lathe in his bedroom. During this period, he attended evening classes in mathematics and drafting and later became a part-time teacher at a technical college. In 1917, while in his early 20s, Mitchell joined the Supermarine Aviation Works, where he rose through the ranks quickly; in 1919, he was named chief designer in the drawing office. In 1925, he was appointed chief engineer. He later conceived a number of important ideas that led to the development of the plane that played a decisive role in winning the Battle of Britain: the Supermarine Spitfire.

Describing the contributions of the pioneer modelers of the early 20th century, Ben Shereshaw commented, "It is important to note that aeromodeling has made—and will continue to make—strong contributions to our engineering leadership."

Henry, Joe and Ben never imagined that model aviation would become the astonishing scene it is today. Their original goal in developing RC back then was simply to find a method of keeping their free-flight models in sight.

At the beginning of this new century, a model aircraft with either fixed or rotary wings can duplicate any flight maneuver performed by a full-size, man-carrying aircraft. Models can even do things that their big brothers can't: for example, an RC model helicopter can fly upside-down. We can only wonder what new achievements we can look forward to in the future.

As Henry Struck, Joseph Kovel and Benjamin Shereshaw watch these developments, they continue to build and fly their models. They also remember with pride the part they played in the early years of model aviation in America.

MODEL AIRPLANE NEWS
HOW TO

Paint Custom Markings

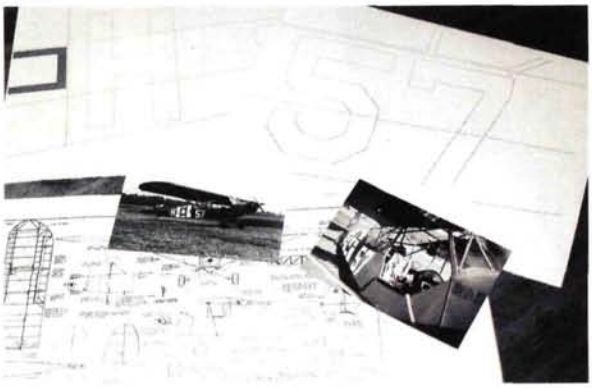
An easy technique for cloth-covered models

by Gerry Yarrish

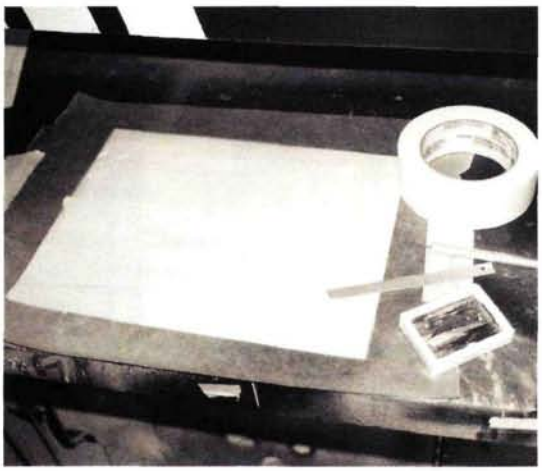
Above: the full-size Piper L-4 Grasshopper. All major markings are white over a base color of dark green. Below: the finished model, ready for scale competition. Any marking you can draw on paper can easily and quickly be painted on your fabric-covered model. Give it a try; you'll love the results.

When it comes to applying painted-on scale markings, letters and numbers, fabric-covered aircraft offer a challenge. Actually, reproducing scale markings is fairly easy once you know the proper technique. Here's how I do it.

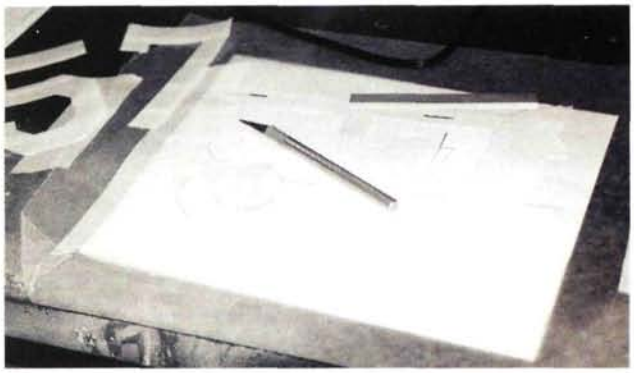
1 ***The materials needed are few: masking tape, a sharp razor knife, a straightedge and the backing paper from some vinyl stick-on graphics. Of course, you also need scale documentation, paint and spray-painting equipment; I used F&M Enterprises* PolyTone paint and a Nelson Hobby Specialties* HVLP spray gun. Let's get started.***



2 ***Use your scale documentation to draw full-size paper patterns of the markings you wish to duplicate. Here, using a CAD program, I drew the "H" and "57" markings full-size for my 1/4-scale Balsa USA Piper Cub turned L-4 Grasshopper.***



3 ***Peel the backing paper from a vinyl stick-on graphic sheet (Coverite or MonoKote trim markings), and apply several horizontal strips of masking tape until you have built up a large "mask." Place the paper template over the tape mask, and secure the paper in place with more tape so it won't move when you cut out your marking.***

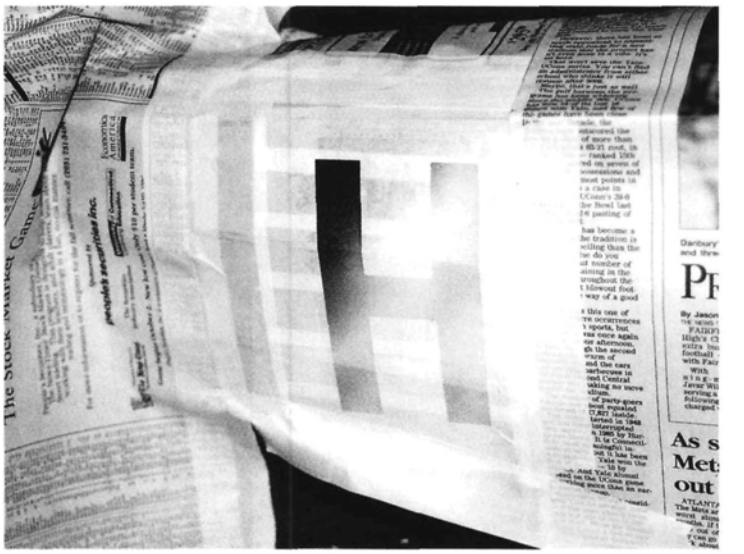


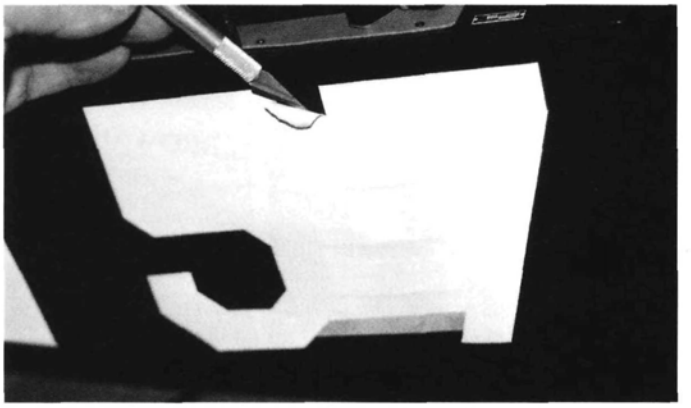
4 ***Use the straightedge to carefully cut out the marking. Cut through the paper template and the tape mask but try not to cut through the backing paper. Carefully remove the numbers and paper template. Now reposition the numbers in the mask, and add a few vertical strips of tape to hold them in place.***

5 *Flip the mask and the letters over and peel off the backing paper, then carefully apply the mask and letters to the model. Here you can better see the vertical strips of tape that hold the letters in place; this is done to help prevent the mask from deforming and wrinkling as it is pressed onto the model.*

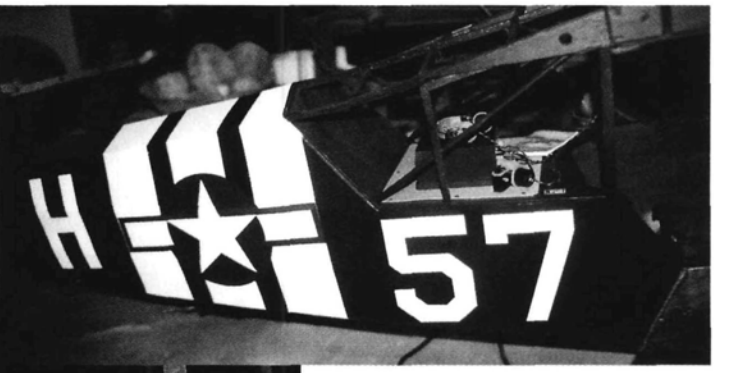
6 *Remove the vertical tape strips and remove the numbers and letters from the mask. Using your thumbnail, firmly rub down the cut edges of the mask to seal them into place. Mask the rest of the model with newspaper and more masking tape, and begin misting paint onto the model.*

7 *To prevent the paint from seeping under the mask, apply several light mist coats rather than fewer, heavier coats. I applied five light coats of white to completely cover the dark green base color. Wait about 20 minutes before removing the masks.*





8 *Remove the newspaper and carefully peel away the tape masks. Use a sharp knife to pick up the edges of the tape and then remove it a strip at a time. Don't rush; you might accidentally get wet paint on the model where you don't want it.*



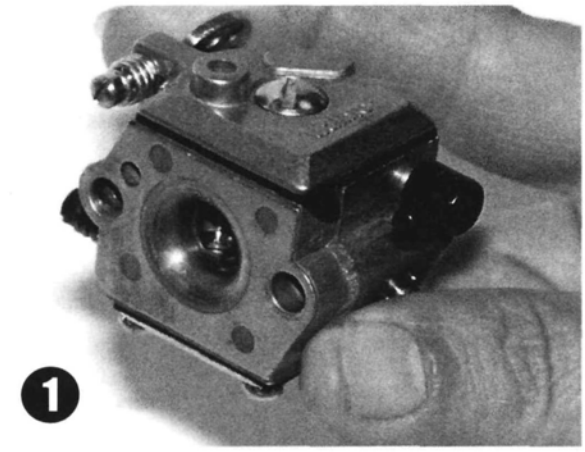
9 *That's it; you now have scale, painted markings on your fabric-covered model. Painted markings look much better than stick-ons, and there's no chance that they'll peel off later. Note the sharp, crisp edges on the numbers. The white vertical invasion stripes were also masked off and painted.*

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.*

by Rick Eyrich

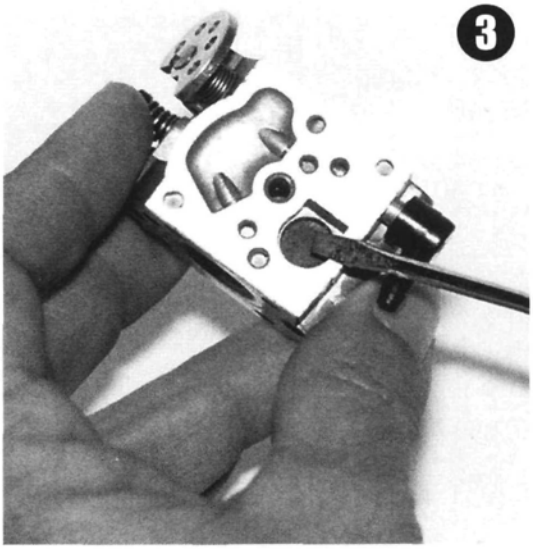
Maintain your Gas Carburetor

Unlike the carburetors found on nitro engines, most gasoline-burning powerplants rely on the basic Walbro butterfly-valve pumper carb. Walbro carbs share the same fundamental layout of fuel pump/metering diaphragms, high/low mixture screws and needle-valve parts. Routine maintenance on these square carbs involves disassembly, a few simple checks and reassembly—certainly within the capabilities of most model builders.



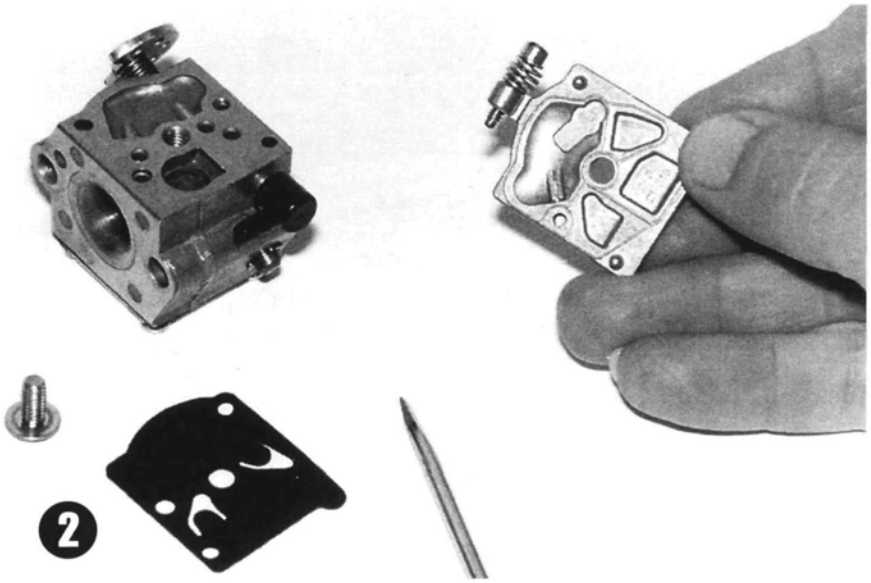
1

Remove the Walbro from your airplane's engine, and clean the carburetor thoroughly before internal inspection. A clean exterior will prevent you from contaminating the interior of the Walbro, which could result in misleading signs of an internal carb problem.



3

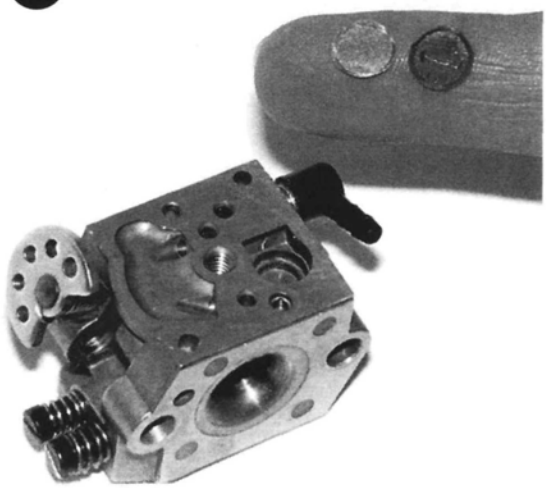
The fuel inlet filter—a small, round screen that prevents debris from passing into the metering section—sits inside this recessed area. Lift the screen free with a small pick or screwdriver. Do not push the screen past this lip when you replace it; doing so might reduce the fuel flow through the carb body.



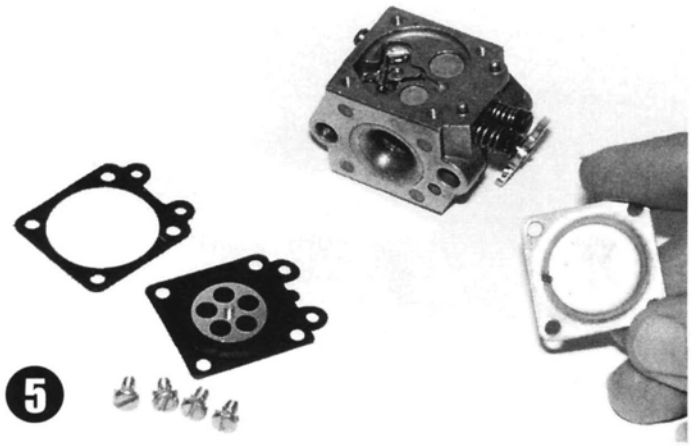
2

The fuel-pump diaphragm is beneath the single-screw plate that usually contains the idle-screw-adjustment arm. The sealing gasket should be pliable, and the pump and gasket should be free of debris; both "flaps" must lie flat against the carb body.

4



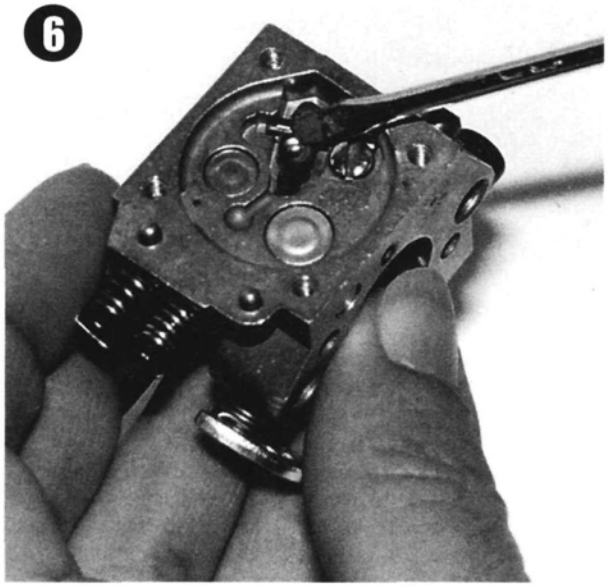
Note the variation in the color of these two inlet screens. Tiny contaminants can block the small openings in the screen and cause the engine to run poorly. Use low-pressure air and denatured alcohol to clean the screen. Savvy competitors replace this screen at the beginning of each flying season—not a bad idea for sport fliers, either.



5

Opposite the fuel pump area is the metering/diaphragm zone. Both flat metal plates and primer are held here by four small screws; you'll find a similar diaphragm/gasket combination underneath.

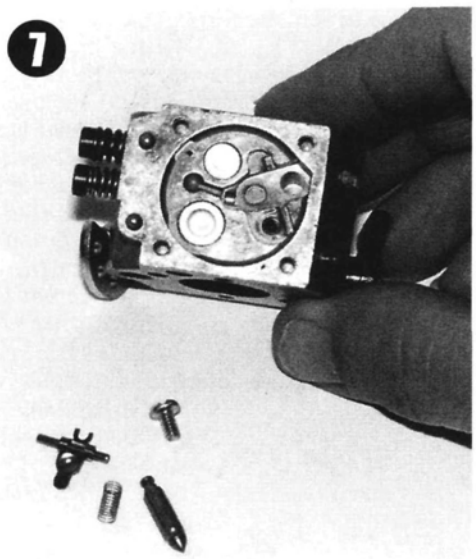
6



This side of the Walbro houses the carburetor's fuel-measuring parts. If any debris has managed to get into this area, you'll likely find it on the inner rim of the gasket seal area. Condensation can find its way to this point, and if left unattended, it will ruin the carb body.

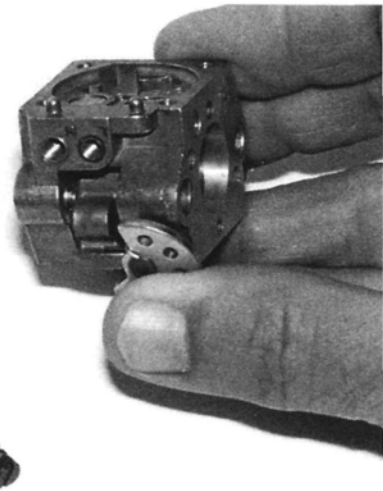
Once you have removed the metering arm, spring, pivot shaft and needle valve, inspect for any marks, embedded gunk or deformities; pay particular attention to the tapered rubber tip of the needle.

7



Last, check the high- and low-end mixture screws. At this point, you're ready to clean the Walbro's internal components completely.

8



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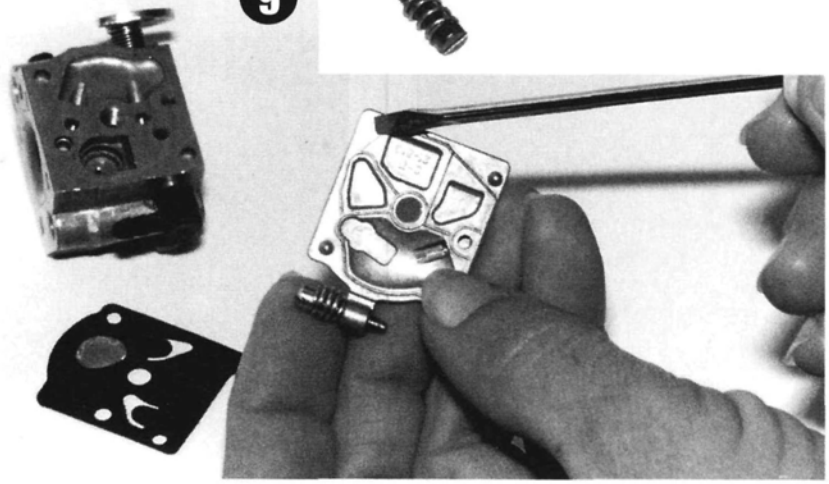
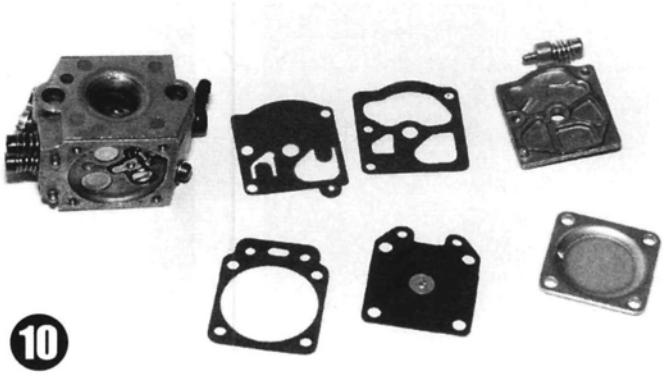


If you find that replacement gaskets are needed, be sure to completely remove the old gasket material, but never use sharp tools to do so. Scratches and nicks in the carb and sealing plates can cause the engine to run poorly. The raised sealing rib on this pump's cover could easily be damaged by a scraper. Use soft tools or paint remover on the old gaskets.



10

After you've cleaned the carburetor, reassemble the Walbro; do so in the reverse order from which you disassembled it. Be very careful to line up all the components correctly. The fuel pump and metering diaphragms are often reinstalled incorrectly. The diaphragm lies flat against the carb body and is followed by the gasket and the one-screw cover plate. On the metering side, the gasket goes on first, then the diaphragm, which is followed by the four-screw cover plate.

Your Walbro's reassembly should be straightforward; when the carburetor is back together, inspect the mounting gasket, fuel lines, fuel filter and tank. Replace any questionable components. Reinstall the Walbro on your model's engine, and head for the flying field!

by Bob Aberle

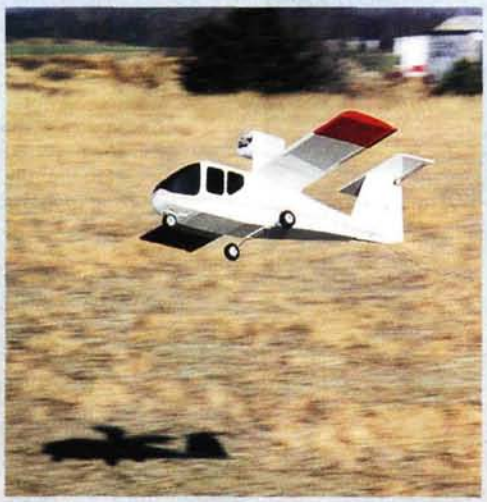
PATCHEN EXPLORER TSC-2

Semi-scale electric observation plane

A neat aspect of building scale models is finding a little-known, full-size aircraft for the subject. Anyone can build a Piper Cub or a Cessna, but not everyone has heard of a Patchen Explorer TSC-2. When I start a scale project, I always look for obscure aircraft. Fellow retired Grumman engineer Nick Dannenhoffer gave me a photo of the Explorer a dozen years ago. I recently pulled the photo out of its file and decided it was time to share my find with others. Working from that single photo and a specification sheet, I ended up creating an electric-powered model.

The Explorer was apparently designed by aircraft engineer David Thurston, who was responsible for some of the early Grumman civilian designs (the G-63 Kitten, for example), as well as the Republic Seabee amphibian. He later went on to design the Teal amphibian. The Explorer was essentially a land-based version of the Teal and was developed for pipeline patrol operation, aerial photography and law-enforcement agencies. The large forward view from the unobstructed canopy made this an ideal observation aircraft.

Construction of a prototype was completed by the Aerofab Corp. of Sanford, ME, and its flight-test program was completed in November 1972. The full-size Explorer had a 32-foot wingspan, weighed 1,370 pounds (empty) and had a maximum takeoff weight of 2,200 pounds and a maximum cruise speed of 125 to 130mph. It was powered by a pylon-mounted Lycoming 200hp 4-cylinder, air-cooled engine.



ABOUT THE MODEL

The Explorer can easily be built in a variety of sizes, depending on your application (and modeling budget!). A larger ⅛- or ¼-scale version would provide an excellent vehicle for a nose-mounted video camcorder or digital camera. A smaller model (such as the one in this article) might house a tiny video camera capable of broadcasting a signal back to a ground-based monitor.

For this construction project, I chose a wing area of approximately 300 square inches and a target weight of 30 ounces. Because of the pylon-mounted, high-thrust-line motor, the choice of electric power made life easy for me. With an electric motor, I didn't have to be concerned with throttle and carb-linkage controls and adjustments, nor did I need to worry about placing a fuel tank in the pylon. The weight of the motor battery, placed up toward the nose, makes it easy to balance the model.

With a model that weighs 30 ounces, I was at the upper limit for a geared Speed 400 electric motor; at the same time, the model is too light for a Speed 500 or 600 or an AstroFlight* 05 Cobalt. My compromise was to choose a Speed 480 (also known as an AP-29). To enhance the output thrust, I also chose one of Tom Hunt's Modelair-Tech* H-100 belt drives using a 2.57:1 reduction ratio along with an 8x4 prop. Selection of the reduction ratio is very important because there is just so much clearance available for a propeller before it hits the top of the fuselage.

CONSTRUCTION TIPS

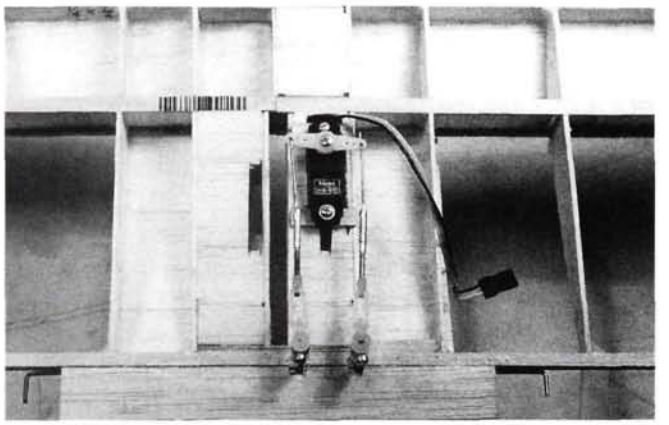
This won't be a step-by-step procedure, but I will highlight some of the

important areas. The wing has a flat-bottom, modified Clark-Y airfoil so it can easily be built on a flat board. My rib spacing tended to be a little on the close side, so you might consider increasing the spacing to 3-inch centers. It is important that the spars be made of spruce, not balsa. Also, don't forget the vertical grain 3/32-inch balsa shear webs between the spars for extra strength.

The motor-mounting pylon is 1/4-inch thick and fits into a slot formed by two centrally located wing ribs spaced 1/4 inch apart. Use a piece of scrap 1/4-inch balsa to set these two ribs in their correct positions. Keep in mind that the wing actually has a small amount of dihedral (about 1/2 inch under each wingtip), so a center plywood dihedral brace is necessary.

Probably the most difficult part of the entire construction is the motor-mounting pylon. Quite a few pieces are involved, and even with these detailed plans, you still might need to add a little of your own imagination. Keep in mind that the thrust-line angle is not very critical to flight performance.

The motor-mounting pylon starts with a center core piece made from 1/8-inch lite-ply. Sixteenth-inch balsa is added to both sides of the pylon, bringing the total thickness to 1/4 inch. Add several pieces of 1/8x1/4-inch spruce and some 1/32-inch balsa just before you screw the Modelair-Tech H-100 belt drive assembly into place. Actually, the H-100 molded beam mounts are attached to the pylon/mount structure. Next, add the two balsa formers N1 and N2. At this point, install the electric motor speed control of your choice to the opposite side of the motor inside the pylon assembly. Solder the ESC wires to the motor terminals (polarity is not reversed when you use a belt drive!). Then add the eight, 3/16-inch-square stringers between the two balsa formers.



Above: the wing on the building board. The flat-bottom airfoil makes building a snap. Note the use of a steel straightedge to keep everything aligned. Center: the underside of the wing center section. Note that the aileron servo is off-center to provide space for the pylon motor mount. The wing spars are made of spruce. Below: the completed model ready for another flight.

SPECIFICATIONS

Model: Patchen Explorer TSC-2

Type: stand-off scale

Wingspan: 43.5 in.

Wing area: 292 sq. in.

Length: 31 in.

Weight: 37 oz. (with 8-cell 800 pack)

Wing loading: 18 oz./sq. ft.

Power used: Graupner Speed 480 electric

Motor current: 12 to 13 amps

Belt drive: Modelair-Tech H-100 at 2.57:1

Prop: APC 8x4 electric prop

No. of channels: 3 (aileron, elevator and throttle), but could add optional rudder with a steerable nose gear

Battery: 8-cell SR 800 or 9-cell 1500 NiMH

Comments: designed by Bob Aberle, the Patchen Explorer is an easy to build and fly semi-scale electric model constructed of balsa, ply and blue foam. There is plenty of room for any type of RC equipment or experimental payloads. The easy-to-enlarge design is perfect for installing a video or still camera in the nose.

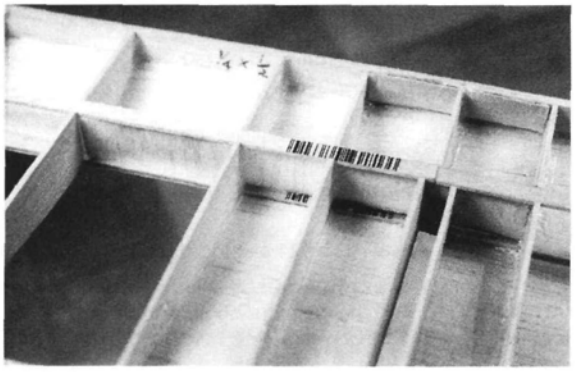
To allow the ESC and motor battery cables (16-gauge wire) to pass down through the wing to a point where the cables can enter the fuselage, you must fashion a channel out of balsa sheet along the side of the pylon. I might mention that in normal flight operation, just after you charge the battery inside the fuselage, you must make sure that the ESC cable is plugged into the throttle port on your receiver, that the aileron servo cable is plugged into an aileron extension cable going to the receiver, and that the battery cable in plugged into the cable running back up to the ESC in the pylon. It may sound complicated, but I can assure you that it will shortly become second nature.

Final motor-pod assembly involves adding 1/16-inch balsa planking and the addition of the front and rear 3/8-inch-thick blocks. Note that you must make cooling holes in both the front and rear blocks to allow air in and out. To allow future access to the motor and speed control, the front block is held in place by screws.

When the motor pod/pylon has been completed, cover the wing with white Super MonoKote*. Add the ailerons, and use the covering material as hinges. Install the aileron servos and control-linkage hardware. Last, place the pylon in its slot, position the thrust line using the plans as a guide, and cement the pylon into place.

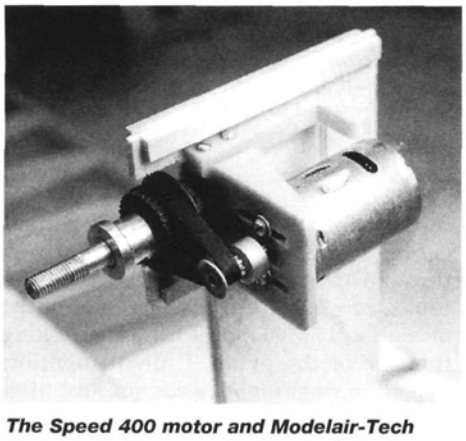
The fuselage is just a big balsa box. The sides are 1/16-inch balsa, which is more than strong enough. After you've assem-

bled the fuselage, turn your attention for a few moments to constructing the vertical fin and the horizontal stabilizer. Note that a length of Sullivan* Gold N' Cable (no. 507) is run up the LE of the vertical fin and then out the top toward the elevator. The brass cable that runs inside the plastic tube connects the elevator servo (mounted inside the forward fuselage) to the elevator control horn. You could, if you wish, mount the elevator servo at the rear of the fuselage using a long cable extension and then connect a wire dir-ectly up to the T-tail-mounted elevator. It's your choice!



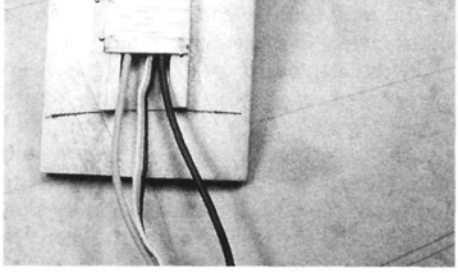
Note the vertical-grain 3/32-inch balsa shear webs between the top and bottom main spars. The center dihedral brace is made of 3/32-inch birch plywood.

The fuselage nose is made of a block of blue foam. This easy-to-shape material has a relatively smooth surface (after sanding) and is light but can be difficult to paint or finish. It is strong enough to accept the nose-gear assembly mount (made from plywood and spruce pieces) without your worrying about the nose wheel ripping out on every landing. I removed a portion of the foam to accept the nose-gear assembly. Then I poured in a generous amount of 5-minute epoxy and set the assembly in place. The main landing gear is made of two separate 3/32-inch wire struts in a trunion block arrangement.



The Speed 400 motor and Modelair-Tech H-100 belt drive attached to the 1/8-inch lite-ply center pylon core.

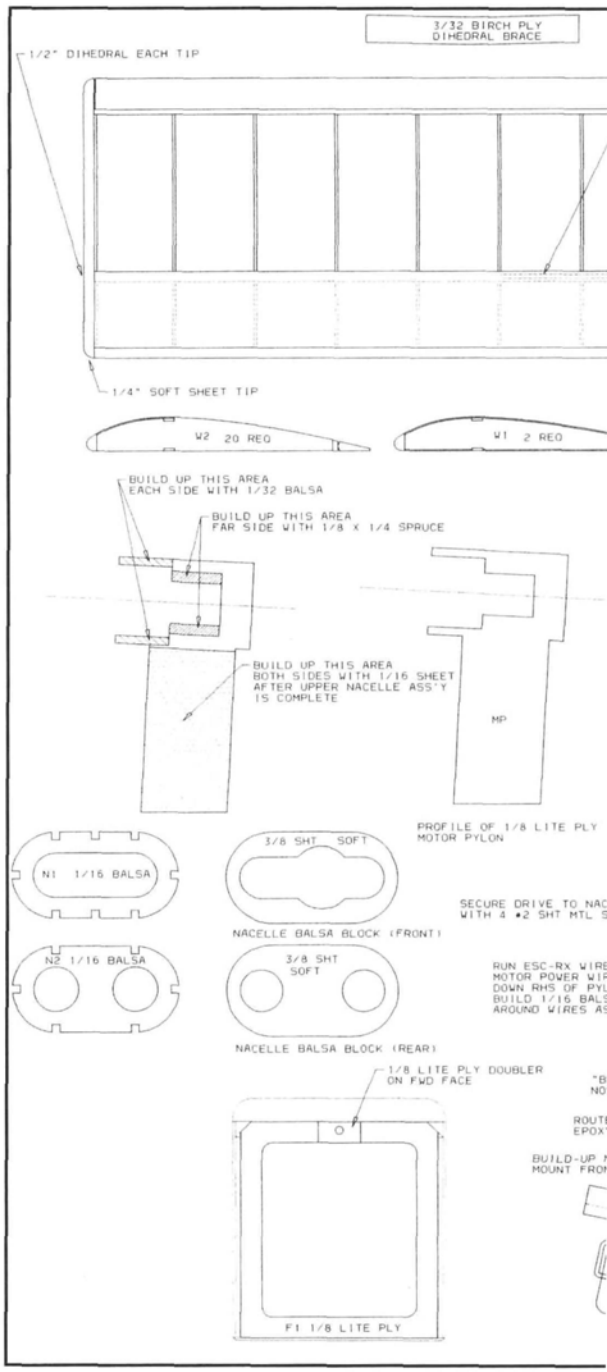
Cover the vertical fin, stab/elevator (and hinges) again with white Super MonoKote. The shaped-foam nose block needs some special attention. I used Sears latex glossy white paint because it doesn't melt foam. Then I marked off the simulated windows and painted them with black acrylic water-based paint purchased at a local crafts store. Use some 1/8-inch black trim tape to outline the windows and eliminate any roughness caused by the masking tape. The final touch is to use 1/8-inch automotive red trim tape. One nice thing about electrics is that you never have to worry about fuelproofing the trim tape.

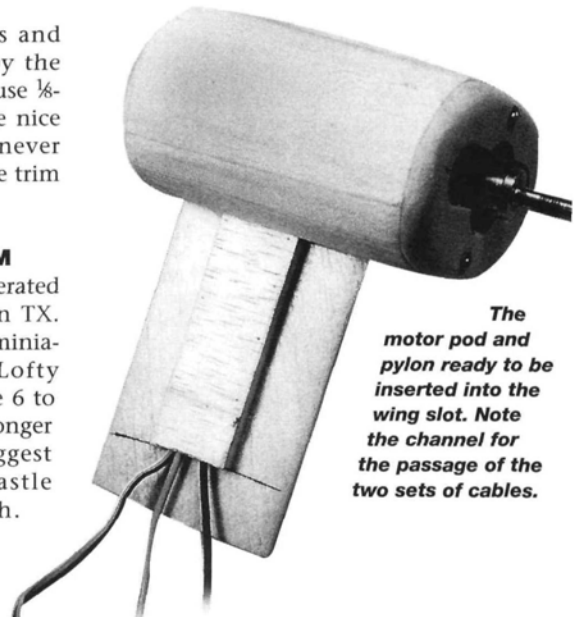


Install your ESC on the side opposite to the motor/belt drive. Note how the throttle and motor cables are routed down the pylon in a channel made of scrap 1/16-inch balsa.

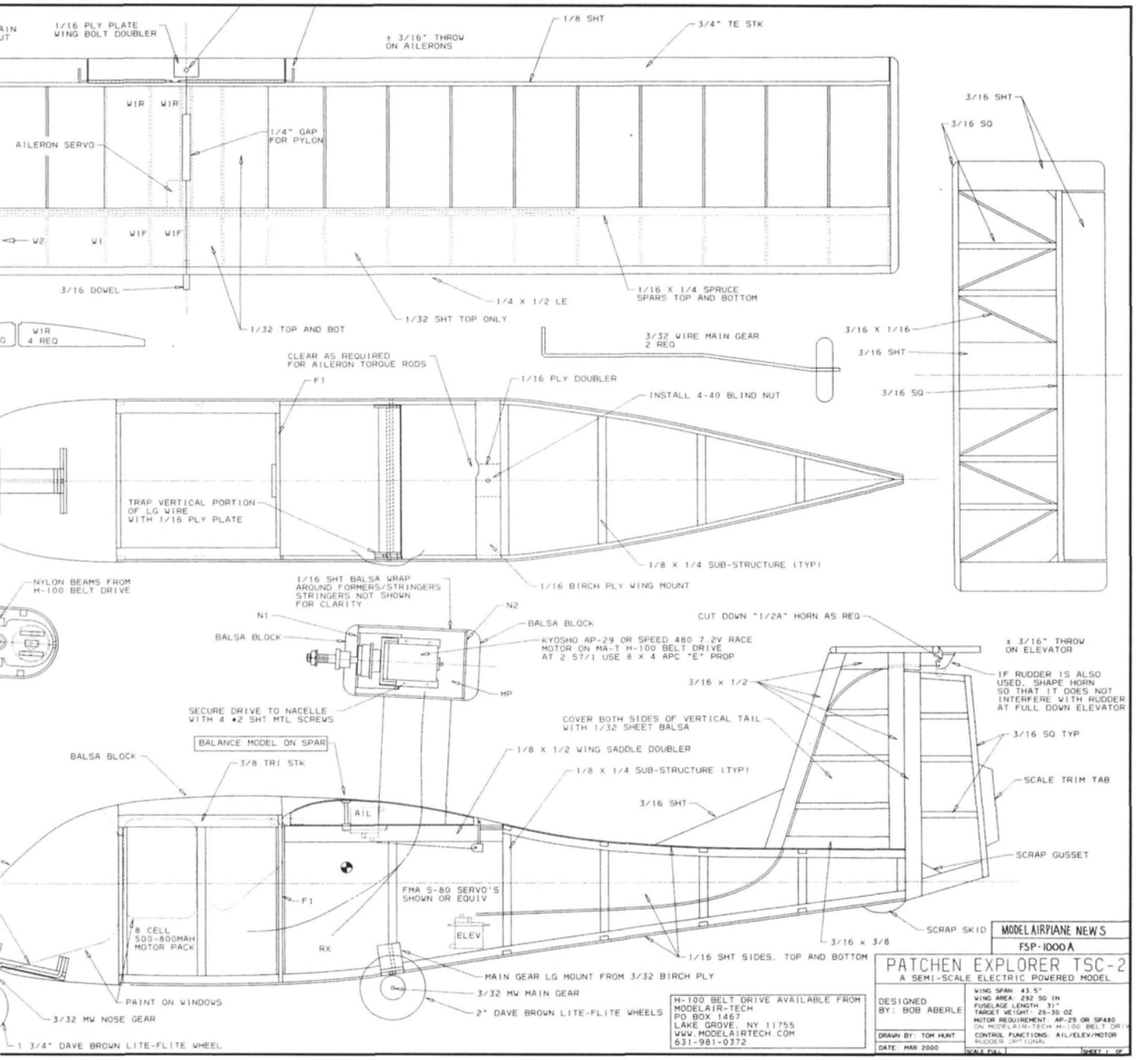
RADIO AND POWER SYSTEM

I used an FMA Direct* Tetra RX operated by a trusty old Futaba* Super Seven TX. The elevator and aileron servos are miniature FMA S-80s. The ESC is a Lofty Pursuits* LPSC-Mini that can handle 6 to 8 cells at up to 15 amps. It is no longer available, so as alternatives, I suggest ESCs made by FMA Direct, Castle Creations*, or Modelair-Tech.





The motor pod and pylon ready to be inserted into the wing slot. Note the channel for the passage of the two sets of cables.

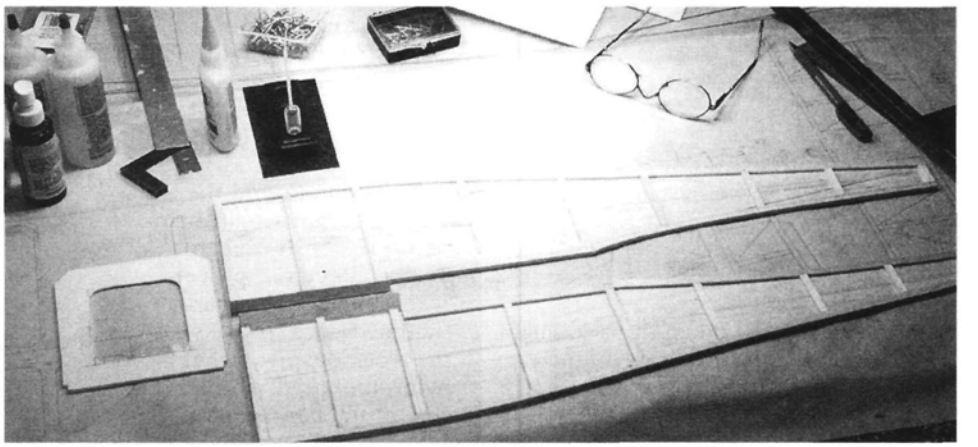


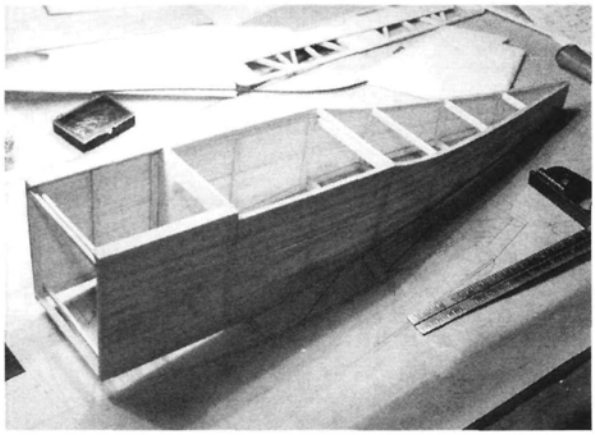
TO ORDER THE FULL-SIZE PLAN, SEE PAGE 132.

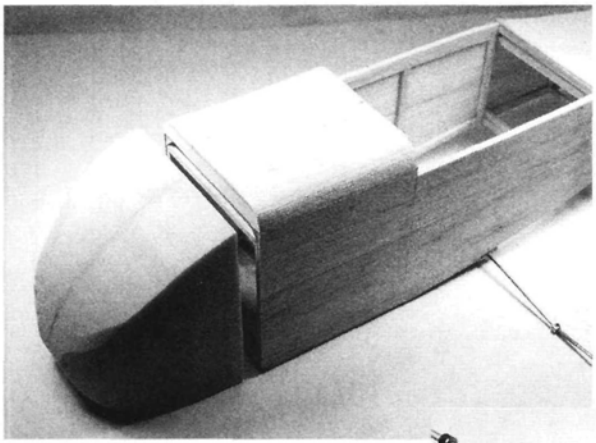
Whichever ESC you choose, it is essential that it have a BEC to save the extra weight of a receiver/servo battery pack.

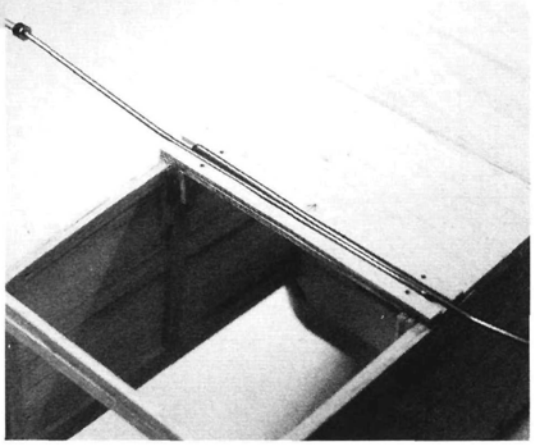
For motor batteries, I have been flying with an 8-cell SR Batteries* 800mAh pack that weighs 9.9 ounces. At about 12 amps of motor current (using an 8x4 prop), I can get about 4 minutes of motor run at full power; more, of course, when throttled back during the flight. An 8-cell 500 AR pack would weigh only 5.6 ounces but would provide only a 2-minute flight, which is not acceptable. Although I have yet to try it, I believe the 1500 NiMH cells that are the same size as AA batteries might offer an excellent alternative. You might have to go to a 9-cell pack with the NiMH, but you would end up at about the

The fuselage sides are made from firm 1/16-inch balsa. The former shown (F-1) is made of 1/8-inch lite-ply.

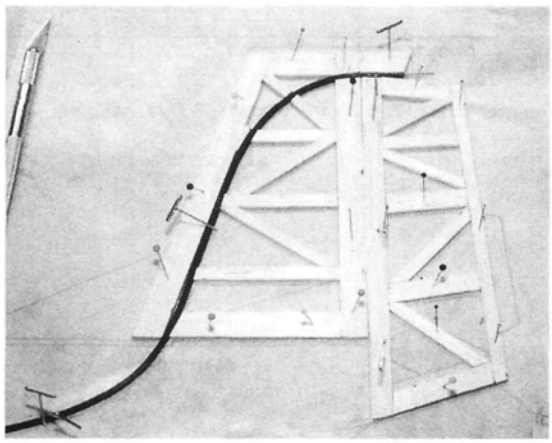








Top: the assembled fuselage sides with the 1/8x1/4 crosspieces and former F-1 in place. Above: blue foam block ready to be epoxied into place on the nose of the fuselage. Right: the nose-gear assembly is fashioned from 1/8-inch lite-ply scrap pieces, 3/32-inch diameter wire and a 1 3/4-inch Dave Brown* Lite Flight wheel. Just cut out a portion of the blue foam to accept the plywood, pour in some epoxy and press the assembly into the foam. Below: the elevator control cable is built into the vertical fin as shown before the sheeting is attached.



same weight as the 800mAh pack. Flight time with 1500 NiMH cells might increase to about 8 minutes; something worth considering!

The final control throws worked out as follows: ailerons move approximately 3/16 inch either side of neutral while the elevator moves 1/4 inch in each direction (up and down). The balance point is just about at the main wing spar, or roughly 25 percent back from the LE. The motor battery pack is placed up against the foam nose block, but the block itself was not hollowed out in any way. You could do that, however, in the interest of saving some weight.

When finished, and flying with the 8-cell 800mAh pack, my Explorer weighed about 37 ounces. The Speed 480 motor increased the weight slightly but also improved the performance. At this weight, the wing loading is still a respectable 18 oz./sq. ft.

SUMMARY

The Explorer looks really different in the air and always attracts attention from other modelers who want to know what it is. The design lends itself to easy scaling, both larger and smaller. The size of the model will be dictated by the payload you expect to carry.

You might also want to add separate rudder control with nose-wheel steering. It wouldn't be difficult to add an extra servo and linkage, and the extra weight would hardly be noticeable. Electric power makes this particular design an easy project despite the pylon-mounted motor. One of the best benefits of this configuration is no broken props. If you take up the challenge and build an Explorer, please share your photos with the magazine. Good flying!

FLIGHT PERFORMANCE

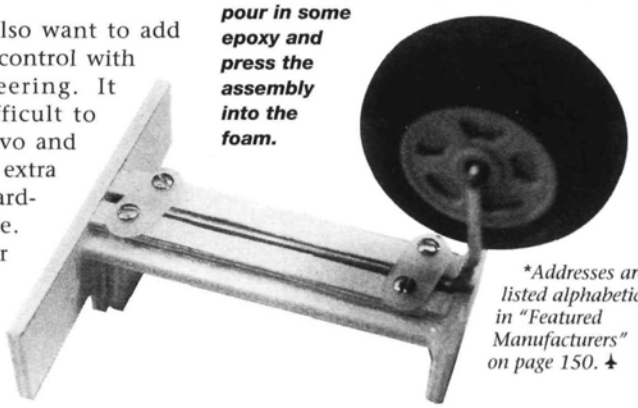
Despite its rather boxy-looking appearance, the Explorer is very easy to fly. Just about all the flights were hand-launched. The plane quickly flew right out of my hands. It has a slight tendency to nose up on launch, but that was quickly corrected with a little down-elevator. Although the Explorer flies smoothly, it is not fast in the air, and as a result, it is not capable of any real aerobatic maneuvers; you wouldn't want to roll the model or even try a loop.

Because of its bulk, you have to keep power on all the way down to a landing. If you run out of battery power at altitude, without any reserve, it tends to descend like a lead balloon; so try to plan ahead and reserve some power for the landing flare.

Despite the fact that I didn't have a steerable nose gear, I tried a take-off on one occasion. Believe it or not, it worked! The Explorer made a slight arc over about a 100-foot takeoff run, at which time I hauled back on the stick. Much to everyone's surprise, it jumped into the air. With a steerable nose gear and a decent runway, I would take off ROG all the time.

The trickiest thing is to select the correct type, capacity and number of battery cells to give you optimum performance. Weight is going to be your biggest obstacle and will make the difference between a marginal or an excellent flyer!

The nose-gear assembly is fashioned from 1/8-inch lite-ply scrap pieces, 3/32-inch-diameter wire and a 1 3/4-inch Dave Brown Lite Flight wheel. Just cut out a portion of the blue foam to accept the plywood, pour in some epoxy and press the assembly into the foam.

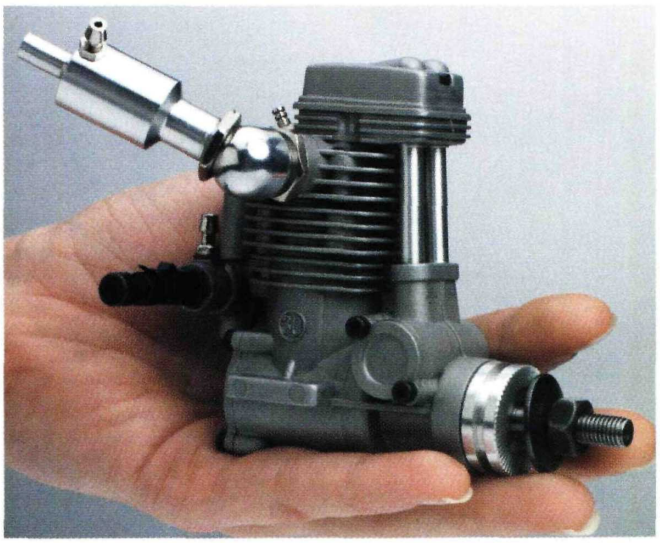


**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.*

 by Chris Chianelli

Magnum XL .30 RFS 4-stroke

Global* has been refining its Magnum line of 4-stroke engines for more than 5 years, and judging by this latest, .30 displacement offering, the years of R&D work have paid off. This is one potent, nice-running little machine. I've run almost every brand of 4-stroke: Enya, O.S., Saito, Webra, HP, Lazer—even a Czech Velkom—but this is the first time I've sat down to a Magnum, and I wish I had done it a lot sooner! I should have had a clue when I opened the box; the instructions for the .30 are among the best, most complete I've ever seen. Not only are they very clearly written, but they also contain useful glow-engine information that the novice (and not-so-"novice," for that matter) modeler will find valuable in the future.



Only the tools were a bit disappointing. The included Allen wrenches were made of too-soft metal for the work they needed to perform. All tools should, obviously, be made of high-grade steel, but this is especially true of small Allen wrenches. At a time when tools seem to be disappearing entirely from 4-stroke engine boxes, I guess this is a picky complaint. Still, if you're going to include them then make them of good, usable quality.

SPECIFICATIONS

Engine: Magnum XL .30 RFS 4-stroke
Manufacturer: Magnum Quality Model Engines
Distributor: Global Hobbies
Street price: $110
Warranty: 2-year
Displacement: .30ci
Bore: 19.7mm
Stroke: 16.4mm
Piston/sleeve: aluminum/hardened steel
Suggested rpm range: 2,200 to 13,000
Weight: 9.6 oz.
Width: 1⅝ in.
Length: 3 3/16 in. (from thrust washer)
Height: 3 5/16 in.
Shaft thread size: ¼-28

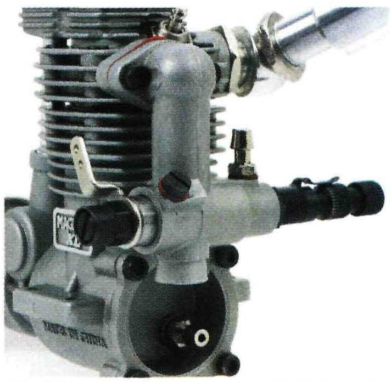
Hits
- Excellent power.
- Twin-needle carburetor.
- Good idle, low vibration.
- Excellent instructions.

Misses
- Poor-quality tools.

BREAK-IN

Break-in is dealt with extensively in the instruction booklet, and I suggest you pay close attention to Global's advice. The instructions say to perform all break-in with a fuel containing no less than 20-percent lubricant and no more than 10-percent nitro. You are also told to break the engine in after it has been installed in an airplane. Personally, I do all my breaking-in on the bench because I feel I have better control.

I ran the .30 for a series of short runs on an APC 9x5 for a total of 30 minutes on a very rich setting using Wildcat's* 5-percent break-in fuel with 20-percent oil that consisted of a synthetic/castor blend (80/20). After that, I switched to Wildcat's 15-percent nitro Premium Extra fuel with an 18-percent oil content and ran the .30 for another 20 minutes on a setting that was still somewhat rich, this time with short periods of mixture leaning. At the beginning of the break-in process, I did need to use an electric starter because the ring had not sufficiently seated against the sleeve, and this is necessary for good compression and hand-starting. Don't go looking for easy hand-starting, good performance, good idle, or even good throttle response until most of this break-in time has elapsed because only then will the ring begin to seat properly and only then will optimum performance be realized. After the ring was seated, however, compression seal was very good and got even better during testing. Some engines need more breaking in than others. Generally—very generally—I've found that the longer an engine's break-in takes, the longer the engine lasts—Enya and SuperTigre, for example. An exception to this is Saito; these engines have a unique combination of ringed pistons running in a chrome-plated sleeve.



Air-bleed carburetors are often found on small displacement engines—not so with the XL30. Magnum saw fit to place a superior, and more expensive to manufacture, twin-needle type on this engine and it work very well and was easy to adjust.

Magnum .30 test results

All tests were done using 15-percent nitro fuel with 18-percent lubricant (80/20 synthetic/-castor mix)

Weather conditions
Temperature—83°
Relative humidity—93%
Barometric pressure—29.82

APC	9x5	12,300
APC	9x6	11,650
Kyosho	9x6	10,830
APC	9x7	11,100
APC	9x8	10,380
APC	10x5	10,400
APC	10x6	9,820
Master Air	10x6	9,530
APC	11x4	9,470
APC	12x4	8,730

Idle

APC 11x4	2,300 to 2,500
APC12x4	2,100 to 2,400

They almost run right out of the box, and they last a very long time.

PERFORMANCE

All performance tests were carried out using an O.S. "F" glow plug. I always use this plug; not only to make certain that all "Air Power" 4-stroke tests are as consistent as possible, but also because I believe it is simply the best 4-stroke plug presently available and gives superior idle and throttle response. Incidentally, the Magnum's idle readings were exceptionally good. Using my very accurate TNC tachometer, I got 2,300 to 2,500rpm on an APC 11x4 and 2,100 to 2,300rpm on an APC 12x4. These readings are good for any small-displacement glow engine, but for a small 4-stroke, they're excellent. After leaning the low-end mixture needle slightly, throttle response was also quite good.

As the performance test proceeded, I became more impressed with this little engine; it's a powerhouse. In fact, it's the most powerful in its category that I've tested yet. I was surprised and impressed. On an APC 10x6, the .30 turned up at 9,820rpm. If the humidity had not been so high (92 percent) during the test, I'm sure the 10,000rpm mark would have been easily attained. Because it has a broad power band, the Magnum has the ability to turn both high-pitch, smaller diameter props at sufficiently high rpm for cleaner designs as well as fine-pitch, larger diameter props that are better for higher drag types such as scale biplanes. Vibration levels, a pet peeve of mine, were quite low.

The Magnum .30 pleasantly surprised me. The engine offers very good power and running characteristics at a fantastic price. The .30 can be purchased for about $110—$40 to $50 less than the competition. This is my first Magnum 4-stroke test, so I can't comment firsthand about its longevity, but I do know a number of guys who are running Magnum 4-strokes for a second season now with no problems at all. You can bet I'll be running more tests on larger Magnum 4-strokes to see whether they're as good as their little brother. If they are, you 4-stroke lovers are going to find a lot of value in the name Magnum, especially considering the relatively high cost of 4-strokes in general when compared with 2-strokes.

KEEP A CLEAN, COOL RUNNING MACHINE

Ever notice that brown, sometimes black, buildup on the outside of your engine? It's generally referred to as "varnish." This crud not only looks bad, but if left unattended, it can also reduce your engine's radiant cooling ability. "Sounds bad," you say, "but have you ever tried cleaning that stuff off?" I have indeed, but there is a way to get the gunk off relatively easily. Demon Clean is a new product meant just for RC engine cleaning. Here's how to use it:

1 To give Demon Clean a thorough test, I used it on an exhaust stack and muffler from an old 4-stroke engine (4-strokes have higher exhaust temperatures than 2-strokes owing to the way they breathe). Look at the black carbon baked on the pipe. If you ever have this degree of buildup on a 2-stroke exhaust pipe, you've probably "cooked" your engine. I figured that if Demon Clean removed this stuff, it would tackle any varnish a 2-stroke engine could serve up.

BEFORE

Since the gases have cooled slightly by the time they reach the muffler, the muffler varnishing is not as severe as the pipe's. This muffler varnish is about as bad as you should ever get with a 2-stroke engine.

2 Always use rubber gloves and eye protection, and work in a well-ventilated area. Apply a thick layer of Demon Clean; don't be cheap with the "goo." Let it stand for 45 minutes or so.

3 For heavily varnished parts such as that seen on this charred pipe, use a brass or copper brush to remove the baked-on crud after the parts have soaked in the Demon Clean for the specified time. Don't use a steel brush because it will scratch aluminum engine parts; that's not good.

4 All the baked-on pipe crud has been removed, but this 4-stroke pipe got so hot that the metal is now discolored. Cleaning will never change this. It's kind of like the discoloration you see on full-size motorcycle pipes close to where they exit the head. The results you're likely to obtain with a 2-stroke exhaust system are more closely demonstrated by my results with the muffler; looks pretty good, especially considering how old this muffler is.

AFTER

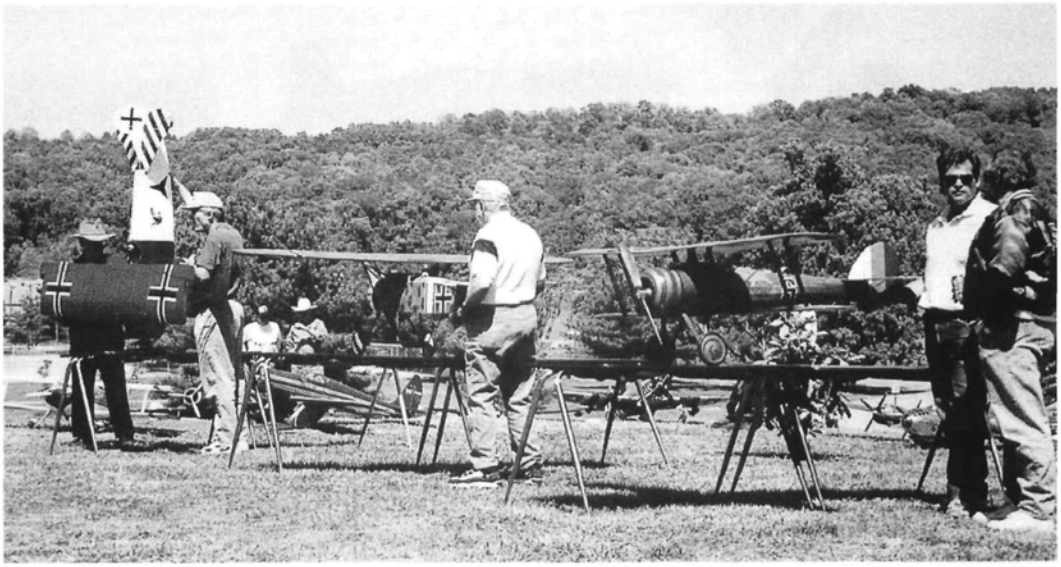
I've tried Demon Clean on the worst possible varnish, and it does a great job of cleaning my mills' heads, pipes and manifolds. This stuff can also be used on internal parts, but if your lapped (non-ringed) piston has a considerable varnish buildup caused by overly hot running, chances are you're ready for a new piston and sleeve.

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.* ✦

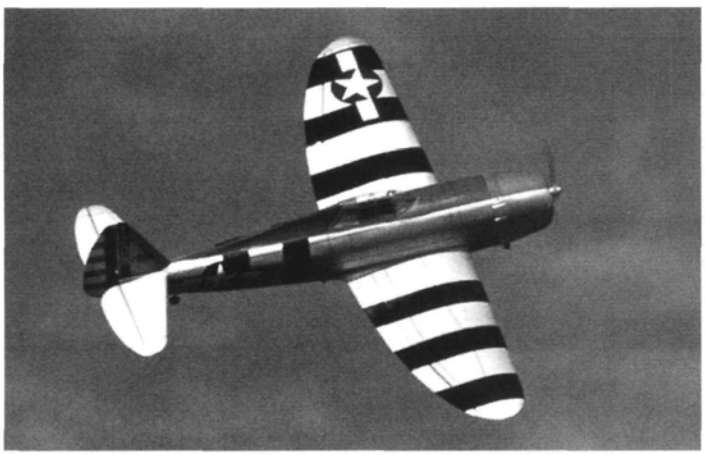
by George Leu

Realism of flight

I receive a lot of mail from readers, and the topic that comes up more than any other concerns the scale realism of flight; in particular, one reader and some friends fly .60-size aircraft, and they feel that they do not receive fair flight scores at competitions compared with those who fly larger aircraft. This results from a lack of understanding by both modelers and judges of what "scale flight" means. Noted scale modelers Bob Frey and Kent Walters compete with what are considered "small" aircraft by today's standards, but they still do extremely well in competition. I hope contestants and judges alike can use this column to gain a better understanding of scale flight characteristics and how scale models should be assessed.



Competing offers a great way to improve your scale modeling and flying skills, and it's a lot of fun. To do well and earn high flight scores, you need to understand how models fly and how their size affects their flight realism.



Smaller scale models such as this .60-size P-47 Thunderbolt have to fly faster than larger scale models to overcome drag and should not be downgraded for this.

Once you get into the 80-inch-span range, scale models such as this Aerotech Mustang start to benefit from better aerodynamic efficiencies, and they look and fly better.

To make the following points more clear, let's review basic aerodynamics. For better flight realism (and higher flight scores), most scale competitors prefer ¼ scale for WW I and Golden Age aircraft, ⅕ scale for WW II fighter aircraft and ⅙ to ⅛ scale for ducted-fan jet aircraft; turbine-powered jets are now even bigger.

No matter how large or small an aircraft is, its ability to fly is governed by the laws of physics. Thrust, drag, lift and gravity are the forces that make flight possible. In straight and level flight, gravity is a constant. Drag is related to aircraft volume (displacement of air and airflow) and is usually related to the aircraft's surface area, some of which provides lift. A larger plane (one with more surface area and volume) creates more drag than a smaller aircraft. Drag is countered by thrust (forward air speed) to keep a plane airborne.

Lift counteracts gravity but can be varied by altering the wing's angle of attack and the control surfaces, but only at the cost of increasing drag. Prop pitch and engine rpm affect thrust; when drag is changed, thrust must be adjusted accordingly.

As model airplanes become larger, their ability to fly more efficiently is improved. A model's overall weight does not automatically double as you double the size of the airframe; i.e., a 72-inch-span model doesn't weigh twice as much as a model with a 36-inch span; this, in turn, reduces the relative wing loading of the larger model. Also, without getting too technical, larger models tolerate higher wing loadings better. All this and more contribute to the relevance of "Bigger is better."

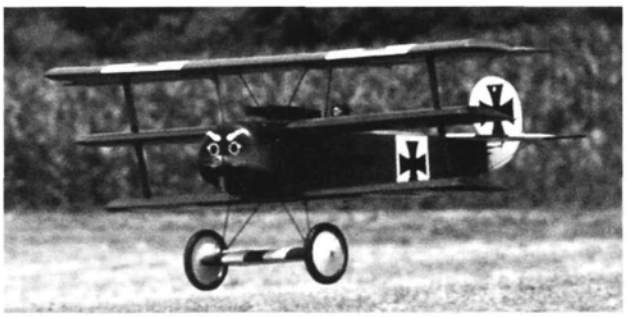
With larger airframes, drag also plays a lesser role. If we compare a ⅙-scale model with a ⅕-scale one, the larger model's wing area may be 25 percent larger than the smaller one's, but its drag will not be 25 percent greater. Bigger means more efficient.

So when we talk of scale flying for realism, it is important to remember that smaller planes need to fly faster than larger ones just to overcome drag. The small plane has less lifting area, and this, too, means that it has to fly relatively faster to stay airborne.

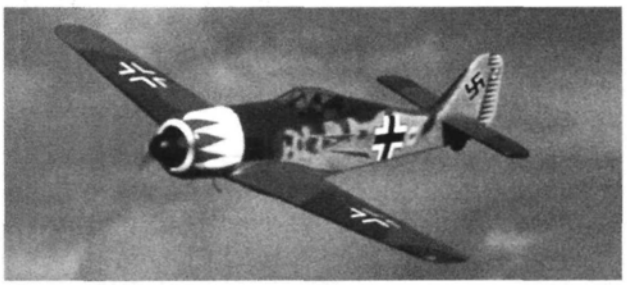
DEPTH PERCEPTION

Another consideration when flying large and small models is how our brains perceive distance. The closer things are to us, the bigger they look. As they travel away from us, models appear to get smaller. We see a small, 50-inch DR-107 One Design as farther away from us than a 108-inch-span, ¼-scale Piper Cub, even though the two are the same distance from us. This perceived distance change affects our perception of speed. Since the DR-107 *looks* farther away, we think it must be flying faster to cover the same horizontal distance as the *closer* Piper Cub has traveled. (See Figure 1.) False depth perception affects how we perceive our models.

To sum up, scale fliers and judges should be aware of a model's size prior to a scale flight round. Small planes need to fly faster than scale speeds to do scale maneuvers. Larger models appear to fly more realistically. Everything being equal, flight judges should understand that planes of both sizes are being flown correctly, and

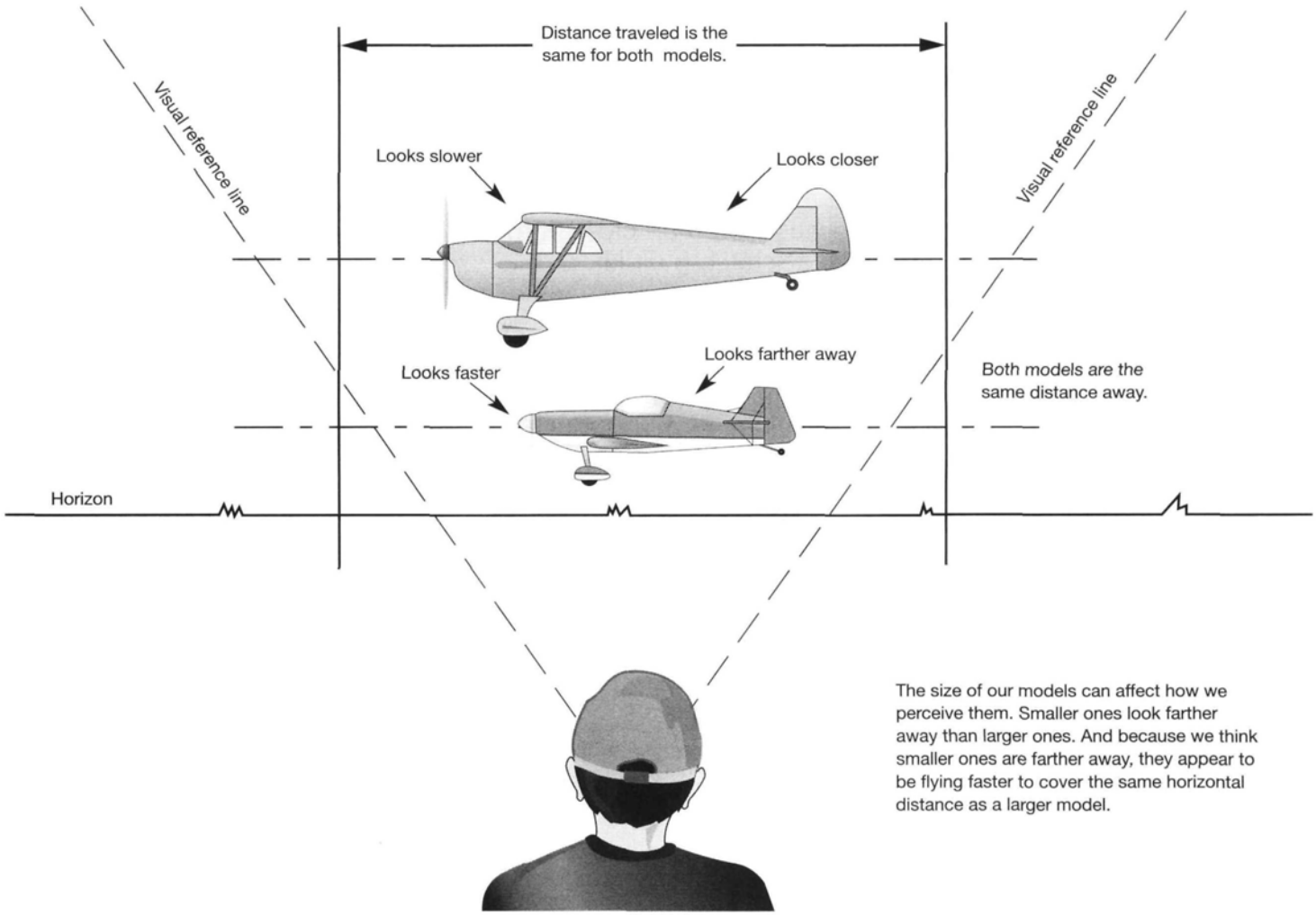


World War I models benefit from larger scale sizes, and they also look and react much better than their smaller cousins.



Big (100-inch) warbirds like this FW-190 from Meister Scale have a lot going for them: they fly extremely well and look very realistic on the wing.

Figure 1. **False depth perception**



The size of our models can affect how we perceive them. Smaller ones look farther away than larger ones. And because we think smaller ones are farther away, they appear to be flying faster to cover the same horizontal distance as a larger model.

both pilots should be assessed accordingly. Factors such as flight attitude, loop size, angles of descent/ascent, banking angle and turning radius are more important for realism of flight than perceived flight speeds.

As a scale contestant, before you fly, take the time to explain to the flight judges how your model will look to them. Make this explanation part of your preflight explanation of maneuvers. While I love large aircraft, there is no reason they should automatically be declared better modeling subjects for scale competition.

BUILDING JIGS

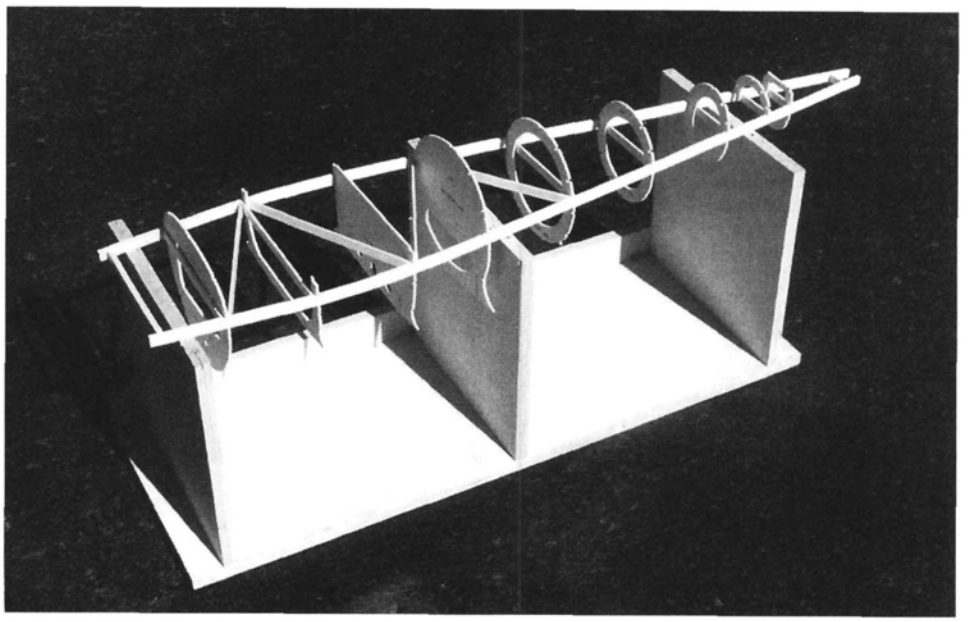
What is a jig? It's a device that holds something in place while you work on it. I use a jig to hold my fuselage crutch as I add formers and stringers. Jigs all but guarantee perfect alignment and offer easy access to the fuselage members during construction. Jigs are ideal for working on round fuselages such as the Ercoupe shown in the photo. I built mine from ¾-inch lumber-store plywood and used glue and screws to hold everything together.

I first attached B (the backboard) to the rear of A (the base) to hold the vertical C parts in place and prevent them from moving around. I next added the three parts C to the base and backboard. Use a level and a 90-degree square to keep everything square during construction. Check to make sure the jig is sturdy, then add a few coats of shellac to make it look nice. I have used my jig for quite a few years, and it has served me well. Make one for your next project, and see what a difference it will make.

MATERIALS

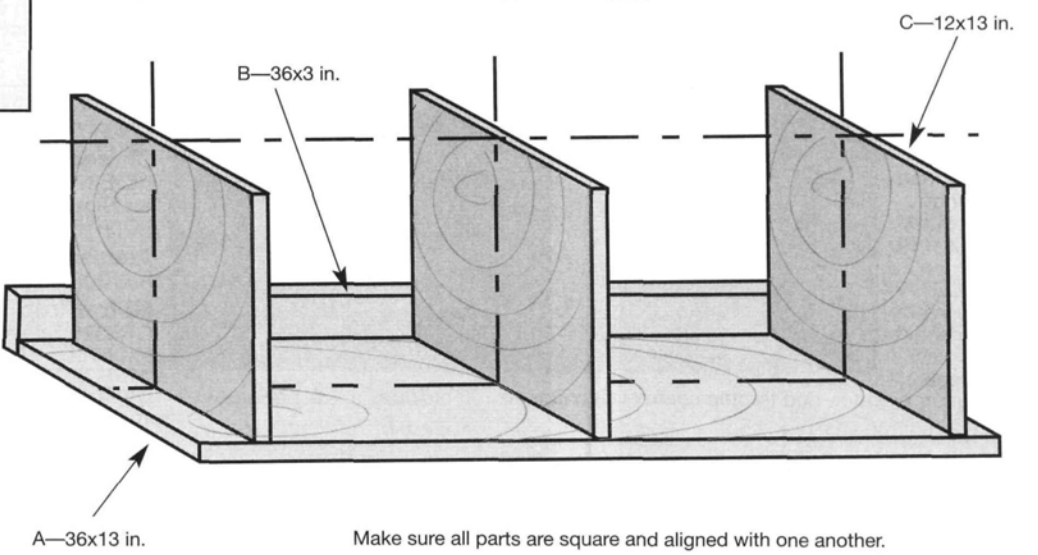
To build a plywood fuselage jig, you need four pieces:

- 36x13 inches (A)—backboard
- 36x3 inches (B)—base
- 3, 12x13-inch pieces (C)

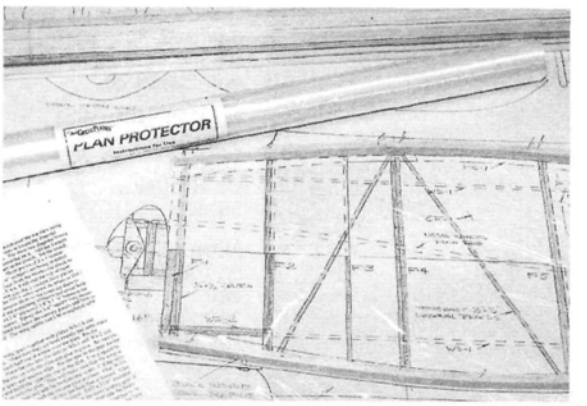


A simple plywood assembly jig will help you build better models. Keeping things in alignment is very easy.

Figure 2. Fuselage building jig



Make sure all parts are square and aligned with one another.



Great Planes Plans Protector film is wonderful stuff. Glue doesn't stick to it, and it comes on a roll that's long enough to build several models. Give it a try.

PLANS PROTECTOR

Available from Great Planes*, Plans Protector film is a welcome addition to any workshop. It serves the same purpose as wax paper, but it has some advantages. It comes in 25-foot rolls (like covering film) and is 27 inches wide. It's long enough to cover even a large wing or fuselage plan, and it resists modeling adhesives, even CA, so you don't have to peel anything away from glued joints. You should get a lot of models built with just one roll. Give it a try.

**Addresses are listed alphabetically in "Featured Manufacturers" on page 150.* ✚

 by Don Edberg

Gyros 101: make your model fly better

This article is for folks who'd like to know how gyros work and what they're used for. I cover most of the important aspects of gyros without getting too technical.

• **What is a gyro?** Quite simply, it is a device that can sense rotation. It's handy for changing aircraft and helicopter flight and response characteristics, since the model has to rotate when it's disturbed by wind gusts or maneuvering. We can use a gyro to reduce aircraft rotations and "smooth things out."

• **Gyros and models.** As far as I know, the first use made of gyros on RC models was in helicopters, so I'll use the heli as an example (fixed-wing pilots, stay with me; there's more).

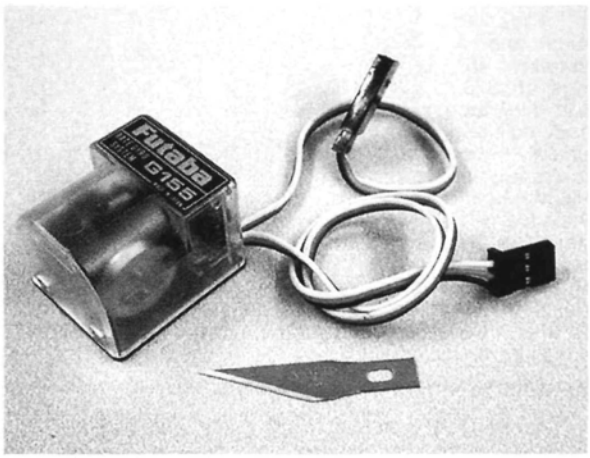
Anyone who has flown a heli knows that they can be flown without a gyro—but only with great difficulty. You find this out in a big hurry when you try to take off with the gyro switch set to "low gain" mode! The heli's fuselage tends to yaw back and forth whenever there's any disturbance, whether because of a control input, a change in engine setting, or a gust of wind.

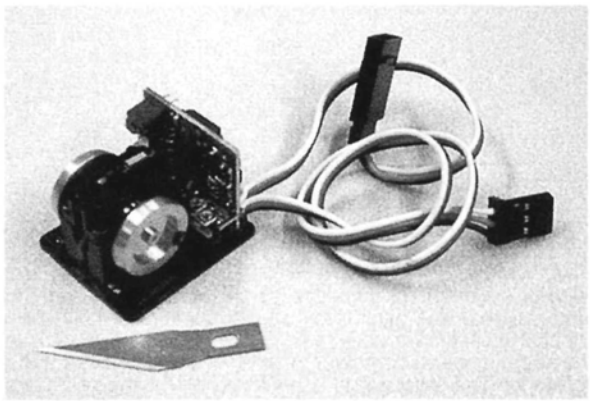
The differences between flying an RC heli and an RC airplane are especially evident when hovering and at low airspeeds; an airplane's forward motion ensures a steady airflow over the tail surfaces to stabilize things. Some helis don't even have tail surfaces! When the fuselage yaws right or left, there's little to resist the rotation. Engineers call this situation "lightly damped." This is where a gyro can be used to improve things.

If we install a gyro so that its "sense axis" is parallel with the main rotor shaft, it will respond to yaw rotation. The gyro uses the sensed rotation to generate a signal that is mixed with the pilot's rudder servo commands coming from the transmitter to add damping to the fuselage motion. This damping tends to slow the rotation of the helicopter's fuselage. A sketch of the connections in a typical gyro setup is shown in Figure 1.

If we increase throttle or a gust of wind makes the fuselage swing clockwise in the yaw axis, we want the gyro to command the tail rotor (the rudder channel) to move in the opposite direction and slow the fuselage motion. This is what an ordinary rate gyro does: it simply helps to damp out unwanted swings in the heli's movement.

It's important to know that a rate gyro does not help to keep the fuselage pointing in a constant direction. On a helicopter, even with the best rate gyro, if you hold full rudder, the fuselage will turn in circles at a steady speed. All the gyro does is prevent the circling heli from spinning faster and faster as long as you held the rudder command.





Above: a one-piece mechanical gyro has two spinning flywheels to sense rotation. The movement of the flywheel axle on its pivot is used to sense motion. Below: mechanical gyro with case removed clearly shows the two flywheels.

To envision how a rate gyro works, sit on a chair that will spin, and spin as fast as you can while holding large pieces of cardboard broadside to the wind. The cardboard damps out rotation; the larger the cardboard's area, the greater the damping. Increasing the size of the cardboard pieces is similar to increasing the gain (or sensitivity) on your gyro.

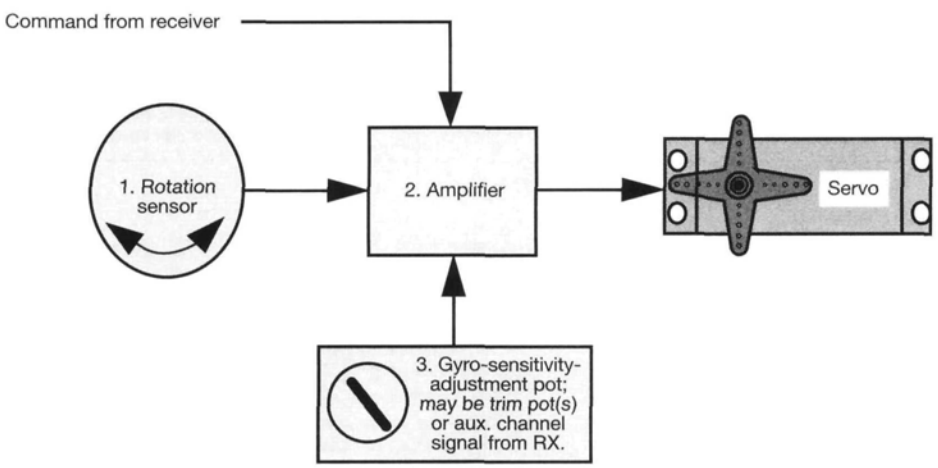


Figure 1. Typical gyro connections. Depending on the gyro's brand, parts 1, 2 and 3 may be combined in a single unit or in two units. Some have no sensitivity-adjustment potentiometer and are instead controlled remotely from the transmitter.

TYPES OF GYRO

• **Mechanical gyros.** When the gyro was first introduced, there was only one type: the mechanical rate gyro—mechanical because it has a spinning flywheel (or two) mounted on a pivot. The flywheel is spun by a small electric motor to serve as a gyroscope. I won't go into gyroscopic theory here, but the spinning flywheel's axis will try to rotate whenever the gyro case is rotated. The flywheel usually has a set of

centering springs, and the rotation against those springs is sensed electronically and is turned into a corrective signal. This signal is fed into a servo and used to make our models fly better. If you'd like to learn more about gyros on the Internet, go to www.lance.co.uk/w3mh/articles/html/csm7_8.htm.

Mechanical gyros are straightforward, work fine and are still sold, but they have a few shortcomings. Because the flywheel is spun by a motor, there's a constant current drain, so a larger battery pack is often called for. Also, its bearings, pivots and other moving parts can wear out, and that can cause slop, reduced sensitivity, and eventually failure.

• **Piezoelectric gyros.** About 20 years ago, Watson Industries introduced a rate gyro that had a piezoelectric drive and sensing mechanism. Part of the word—"piezo"—is derived from a Greek word meaning stress or applied force. In piezoelectric materials, an applied force will generate a voltage, and conversely, you can also apply a voltage to drive them. An example of these materials may be found in the common gas lighter systems that produce a spark when you "click" on their trigger. The Watson's piezo element was cut from quartz crystal so that when it was driven, it would produce a signal that was proportional to the rate at which the gyro was rotated. The rotating motor and flywheels were eliminated.

The use of piezoelectric crystals for rate gyros was revolutionary; the new system was more sensitive than a mechanical gyro and showed itself to be more robust during encounters with the ground. Unfortunately, the Watson stabilizer never really gained popularity; it cost a lot to produce, and the modeler had to solder a wire into the servo amp to make it operate, but it was really way ahead of its time.

After a few years, piezoelectric materials were reintroduced into gyros—and with great results. Now, most of the major RC system manufacturers sell piezo gyros that offer great performance at a reasonable cost. Improvements in electronics have allowed these gyros to be made even smaller than the mechanical units. They also have much less current drain, since a motor is no longer needed to spin the flywheel. Because they don't use much battery power, you can get by with smaller battery packs and so reduce your model's overall weight. Sensitivity to motion is enhanced because there are no rotating parts with bearings to wear out. The piezo gyros are the way to go.

• **Wing gyros.** These are intended for fixed-wing airplanes; they smooth things out in the roll axis. They're simply rate gyros that have two servo outputs rather than one and are intended for aircraft that have two independent aileron servos. These are mainly used to stabilize the motion of scale models and any model that has to land in wind when the wings might bounce back and forth. I've also used a wing gyro in a competition glider to smooth flight performance during landings.

• **Heading-hold (HH) gyros.** The newest gyros provide not only the damping control discussed earlier but also the "stiffness" needed to keep an aircraft at a certain attitude; in the case of a helicopter, they keep the fuselage pointing in a constant direction.

The analogy of the HH gyro is to sit on a pivoting chair and to tie a spring to the ground. The spring causes the chair to always return to the same heading: the stronger the spring, the quicker it returns to that heading. They also provide damping like conventional rate gyros to prevent your heli from "overshooting" the desired position and oscillating back and forth.

HH gyros are very popular with heli pilots, as they essentially allow them to ignore the tail rotor while hovering. More experienced pilots like the way the HH gyro holds a particular heading both in hover and when doing aerobatics in crosswinds, backward flight and in 3D flying.

HH gyros are more expensive than other types, but their performance makes them worth the extra cost. In the RC heli world, they are fast becoming the norm, both with beginners and master 3D fliers.

GYRO GLOSSARY

Acceleration: how fast a speed changes. Some gyros account for angular acceleration in addition to angular rate.

Angular: having to do with the *angle* of something turning. *Angular rate* is the rate at which an angle changes.

Attitude: the direction or angle of something.

Control amp: a part of the gyro system that converts sensor signals into servo motion.

Damping: a measure of how fast a motion dies out. The higher the damping, the faster it dies out, and vice versa.

Gain: how the device reacts to inputs. The higher the gain, or sensitivity, the bigger reaction there is.

Heading angle: the angle of the body or fuselage of the model with respect to the ground.

Heading-hold gyro: a gyro that adds stiffness to maintain the heading angle of an aircraft regardless of whatever else is going on.

Piezoelectric: a material that directly converts motion into a voltage that can be measured.

Polarity: the sense in which a gyro reacts. If the gyro commands the wrong direction, you need to reverse its polarity.

Rate: speed at which something changes. Higher rates equal faster changes.

Rate gyro: a gyro that provides damping and tries to hold a constant turn rate; not to be confused with a heading-hold gyro.

Roll: the aircraft's bank angle with respect to the ground.

Sense axis: an imaginary arrow that points in the direction around which the gyro senses rotation. For a helicopter, you want the sense axis to be parallel to the main rotor shaft.

Sensitivity: see "Gain."

Sensor: a device that can sense some sort of motion.

Stiffness: the quality of a system that makes it return to neutral after being disturbed.

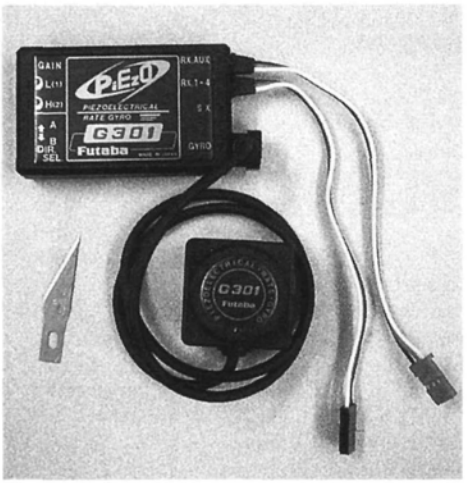
Wing gyro: a gyro that is intended to "smooth" or "damp out" an aircraft's roll motion. These can be handy for twitchy models, or for takeoffs and landings in gusty winds.

Yaw: the angle the fuselage makes with respect to its heading. Most of the time, we want yaw to be zero.

INSTALLATION AND SETUP

To help ensure that your gyro is not subjected to excessive vibration, you should plan its installation carefully. I make a balsa box and line it with foam rubber so that the gyro case fits snugly inside. This helps to protect it from the engine "noise" and vibration that can cause performance problems. If you have a gyro with more than one piece, the sensing portion needs the most protection. The other parts can be mounted more firmly, perhaps with double-sided adhesive foam tape.

The gyro's sense axis is usually marked on its case with a circular arrow (see



A modern piezoelectric gyro—lighter and more responsive than a mechanical gyro. The only way to fly!

Figure 1). If it isn't marked, it's generally perpendicular to any circular parts of the sensor case. Double-check to ensure you installed the gyro as you want it, or you'll see some strange aircraft behavior!

Gyros sense rotation, so it isn't too important where we mount them, as long as the sense axis is pointed the right way. Remember that when a body rotates, every part of that body rotates the same amount. In a helicopter, we could mount the gyro at the very front of the cockpit, in the rear near the rotor shaft, or even in the back of the fuselage near the tail rotor! The only things to worry about are ensuring the proper temperature, sense-axis direction, adequate mounting space and low vibration levels.

Having installed the gyro system, just plug the servo into it, and connect the gyro to the receiver. Depending on the brand and type of gyro, you'll have one or two connectors to plug into your receiver. If there's a second connector, it will be used to remotely control gyro sensitivity or gain from the transmitter. Wing gyros have a third connector for the second servo. Rudder gyros, often used to smooth takeoffs in tail-dragger and scale airplanes, will not have this third connector.

OPERATIONAL CHECK

After you've connected the gyro to your airborne gear, you must check some very important things:

- Power up both the transmitter and the airborne system.
- Allow the gyro about 5 to 10 seconds to warm up and settle into its normal operating mode.

I'll assume that you installed the gyro to damp out vertical rotations (yaw or rudder direction). When you quickly move the tail to the right (the nose moves left), the gyro should command the rudder/tail-rotor servo to move in a way that makes the tail move left. If you damp wing roll, you should check for aileron servo motion opposing the roll you input by rotating the wings.

- Depending on how the radio is installed, it is possible to have gyro response reversed, and if you do, you'll have to reverse the gyro's polarity by flipping a switch on its case. If your gyro does not have a polarity-reversing switch, you'll need to rotate it so that the sense axis is 180 degrees from where it was before. Note that you cannot reverse the servo's direction to get the proper response you want.

A wing gyro has two outputs and is intended to help stabilize fixed-wing models that have two independent aileron servos.

- **Gyros and fixed-wing aircraft.** Scale models, in particular, can benefit from having a wing and/or rudder gyro, especially when the model is not very stable or is very sensitive. You can put a rate gyro in a model to better manage rudder input, and it will let you take off without needing as much yaw correction as you usually need.

As previously noted, you can also install a wing gyro with its sense axis along the fuselage centerline so that it will damp rolling motion and will give opposing aileron input whenever a wingtip drops. This is a nice feature, but it isn't very helpful if you're trying to do snap rolls!

If you fly competitively, before you install a gyro in your model, be sure it's allowed. Some scale events allow gyros only on rudder.

- **Gyro sensitivity.** Once you've verified that the gyro's polarity is correct, you need to set its gain, or sensitivity. Some gyros have one or two trimmer potentiometers that can be adjusted with a small screwdriver. How much gain you have is important: too much gain and the model will start wagging, or "hunting,"—not a good thing. A gain that's set too low is like not having a gyro at all. It's best to start with low gain, increase it until the model starts to wag back and forth, and then back off the gain a little. If you have a gyro with two gain settings, set one to be nearly off so that you can use it if you've set the other setting too high!

How much gain (sensitivity) you'll need will depend on a bunch of things, including the model's dynamics, servo travel and servo speed. You can take the plane off and try the high gain setting: if the model's wings start to "wag," you've set the gain too high. Switch to the low gain setting and adjust the gyro until you get good holding power.

Important: the faster the servo is, the better the gyro works to stop unwanted motion. Also, you should minimize slop or free play in any of the linkages.

Heli pilots usually want two gain settings: a lot for hover, and none for aerobatics. Fixed-wing pilots may want high gain for takeoff and landing and intermediate or low gain for regular flight and none for aerobatics.

For aerobatics, turn off the gyro, or the gyro will try to "fight" with you. For this, be sure to pick a gyro that has gain settings that can be remotely adjusted by a separate channel on your transmitter. Some of the smaller, inexpensive gyros don't have this remote sensitivity-adjustment capability.

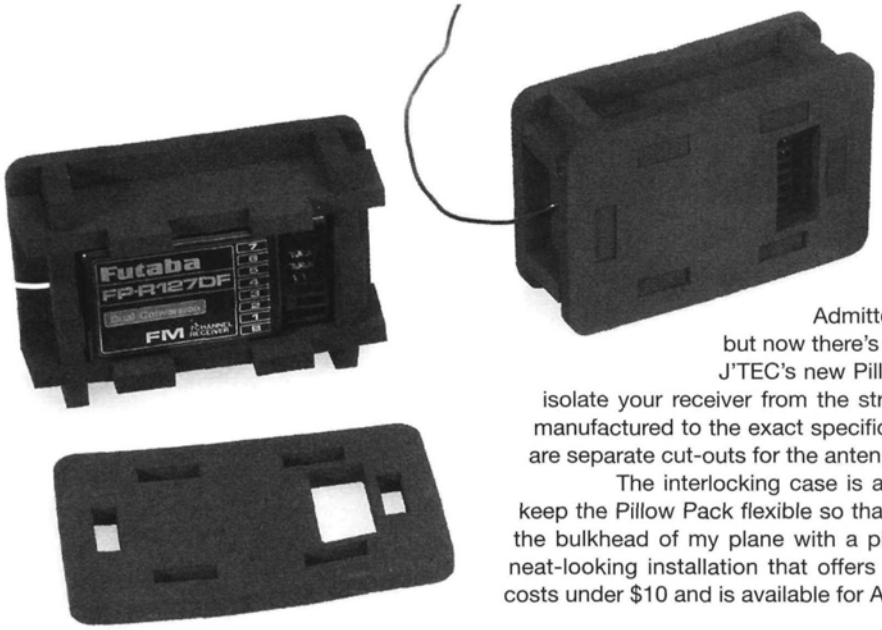
If you have a computer radio capable of selecting a variety of "flight conditions," you can set up a condition so that when you move any of the control sticks past a certain position (such as half or three quarters of stick travel), the gyro is automatically turned off.Then you don't ever have to worry about switching the gyro on or off! Helicopter pilots use this method quite a bit in their different modes of flight. When flying, you must know which gyro gain you're using. Make sure you understand which switch controls gyro gain and which position is which. Write it down on your field box to make sure you don't forget.

This article has only touched the surface of the vast world of gyros. I hope you've learned enough to be able to use them in your models.

PRODUCT WATCH

Editors' picks of the month

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we try it out first to bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."



J'TEC

Pillow Packs
Receiver protection

Airplane receivers are subjected to a great deal of stress from engine vibration, aerobatics and yes, those landings that are less than perfect; all of these can ruin delicate electronics. That's why it's so important to protect your radio gear. Over the years, I've packed my receiver in everything from foam sheets to bubble wrap. Admittedly, these taped or rubber-banded bundles are unsightly, but now there's an alternative.

J'TEC's new Pillow Pack is an inexpensive, compact and effective way to isolate your receiver from the stresses of flying. The Pillow Pack is a foam receiver case manufactured to the exact specifications of your receiver. Instead of a single wire exit, there are separate cut-outs for the antenna and servo leads to pass through.

The interlocking case is assembled with flex CA or silicone glue. These adhesives keep the Pillow Pack flexible so that it maintains its damping qualities. I fastened my pack to the bulkhead of my plane with a piece of hook-and-loop material. The end result is a very neat-looking installation that offers protection and peace of mind as well. The Pillow Pack costs under $10 and is available for Airtronics, Futaba, Hitec and JR receivers. —*Bob Hastings*

J'TEC Model Engine Accessories, 660 Pacific Ave., Oxnard, CA 93003; (805) 487-0355; fax (805) 487-0936; www.jtecrc.com.

MAXX PRODUCTS INTL.

MX-6800 Pico Universal Receiver
Tiny radio gear

Maxx Products Intl. (MPI) recently introduced a new micro RC FM receiver, the MX-6800 Pico Universal unit. The receiver comes in a small, orange plastic case that's 1¼x½x½ inches, and a rather large crystal projects an additional 5/16 inch above the case. It weighs in at 7 grams (0.246 ounce) with the case and 5.5 grams (0.193 ounce) without the case—about ¼ ounce or slightly less. The receiver antenna is only 22 inches long and is a relatively fine gauge, like no. 26 wire.

The MX-6800 is a single-conversion, narrow-band FM receiver that has what is called "auto shift select." In other words, the circuit receives a signal from your RC transmitter, determines if it is high or low deviation (like Futaba or Hitec on one side and Airtronics or JR on the other) and sets itself automatically so that when you order the MX-6800, you don't have to specify which transmitter you plan to use. At the time of these tests, the MX-6800 was being offered on 72MHz on all even RC channels with the exception of channels 12, 14 and 36, and MPI expects to have most of the odd channel numbers by the time this article is published.

The MX-6800 also has a fail-safe feature that will lock on the last frame received if the signal is interfered with or lost. In practice, I did find that the controls tended to go hard over when the signal was lost. You might experiment with this and make your own observations before your first flight. Keep in mind that the range is very good, so for most applications you won't expect to see the fail-safe kick in.

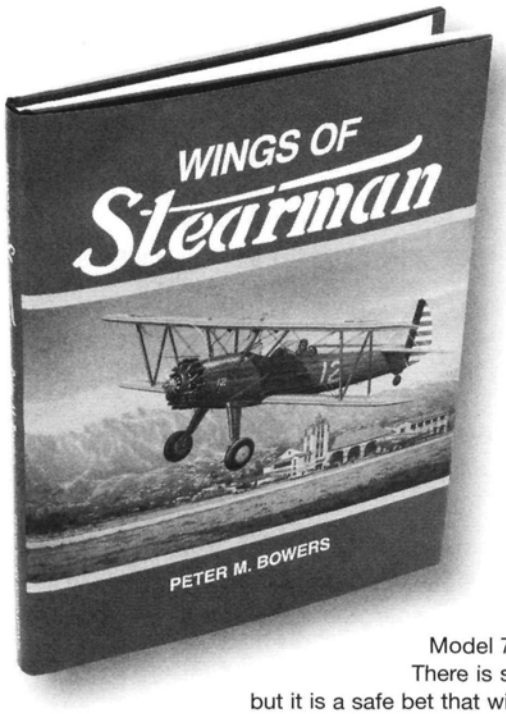
Operating voltage is claimed to be from 3 to 7 volts. For some very lightweight applications, it may be possible to operate on only 3 Ni-Cd cells. The connector block will accept Futaba, Hitec, JR and Airtronics Z connectors. The center pin is battery positive, and a decal on the side of the receiver case indicates the proper polarity. Keep in mind that this is a 4-channel receiver but has only four connector ports, so when you use all four channel functions, you must use a Y-harness to connect the fourth servo.

Range is stated in the specifications as 1,000 feet. In my tests, I used a Hitec Prism-7 transmitter with a Spectra synthesized radio-frequency module so that I could simply dial up the correct channel. With only one transmitter antenna section extended, the MX-6800 had a range of about 150 feet. With the antenna fully extended, the receiver operated at 720 feet before the fail-safe started to kick in. At 750 feet, I could no longer see the model clearly. This is excellent range, and remember: it was accomplished with just a 22-inch-long antenna!

This micro receiver also proved to be very selective. Using several transmitters, I tried to "hit" the MX-6800 on both adjacent channels (just 20kHz away). In each case, there was no interaction whatsoever. So this micro receiver could be flown successfully and safely at an RC flying field.

If you use the MX-6800, two microservos and a micro electronic speed control with BEC, the total radio airborne weight could easily be less than 1 ounce, which would enable you to operate three control functions (rudder or aileron, elevator and motor control). For a glow plane or a glider, you need only substitute a small battery pack of 50 to 100mAh capacity for the speed controller. Best of all, the MX-6800 costs only $59, including the crystal. Very impressive! —*Bob Aberle*

Maxx Products Intl., 815 Oakwood Rd., Unit D, Lake Zurich, IL 60047; (800) 416-6299; (847) 438-2233; fax (847) 438-2828.



FLYING BOOKS INTL.

"Wings of Stearman"
Colorful primary trainer

This hardcover, 139-page history of Lloyd Stearman and the classic Stearman biplane is the latest reference work by renowned aviation historian and photographer Peter M. Bowers. Part of the "Historic Aircraft Series" published by Flying Books Intl., "Wings of Stearman" is a beautifully photo-illustrated volume that covers every aspect of the famous primary trainer. From the early C-1 through C-3 models, the military Kaydet trainer and surplus aircraft to crop-dusting and Hollywood movie roles, all 17 of the separately designated Stearman aircraft models are discussed. Five chapters explore the development and operational history of the famous Model 75; I especially liked the information provided on the early airshow pilot Sammy Mason and his famous orange, white and checkerboard PT-17.

Wonderful black-and-white photography supports the text, and there are several personal accounts from pilots who owned and flew the aircraft. Of particular interest to the warbird modeler is the detailed information regarding the military variants including the Army PT-13 and PT-17, Navy N2S-3 and the RAF PT-27. Also included in the book are a set of 3-view drawings of the Model 75 drawn by Robert L. Parks.

There is simply too much information included in this single volume to fully describe here, but it is a safe bet that with its 290 photos, this book—available for $39.95—will become a standard reference source for the famous Stearman biplane Model 75. *—Gerry Yarrish*

Flying Books Intl., Publishers & Wholesalers, 121 Fifth Ave. N.W. Suite 300, New Brighton, MN 55112; (800) 225-5575; FAX (651) 635-0700.

MRC

Super Brain 819
Computerized charger simplicity

MRC's model 819 Super Brain battery charger is a very compact unit (particularly for an AC/DC model) that measures 2½x5x3½ inches. This plain-looking device sports only a single LED for a display; the simplicity is all part of MRC's plan to make the Super Brain 819 as easy to use as possible. There's nothing to adjust and this charger delivers superior performance for 6- and 7-cell Ni-Cd applications.

The 819 automatically senses when a battery is connected to the charger and fast-charges the pack until delta peak is sensed, or for a maximum of 40 minutes. The charger automatically switches over to a trickle-charge after 90 minutes and then shuts off. The 819 is able to detect a false peak, commonly found in older batteries, by delta-peak-threshold and a method called voltage-change rate compared with charge time. If the charger is left plugged in and untouched for 120 minutes, it shuts down and must be unplugged and re-plugged in.

Charge time with my 1500mAh battery pack was 21 minutes. I noticed the charger was warm, and the battery still felt cool—close to room temperature. I placed the battery on a discharger at a rate of 20 amps. Within 4 minutes and 30 seconds, the battery had discharged; I was concerned that the battery had not reached its full peak, so after the battery cooled, I charged it again. The charger switched to trickle-charge after 21 minutes and again felt cool. This time, I unplugged the battery and then plugged it back in to see if the charger would peak the battery; after 6 minutes, the charger shut off again but the battery felt slightly warmer. On the discharger, the battery took 5 minutes to drain. The charger's temperature never wavered above a warm feeling, even after I charged three packs in a row.

The Super Brain 819 charges the battery without overheating and damaging the battery. Overall, it's an excellent charger that does the job without damaging your packs. For around $50, the MRC Super Brain 819 is a good value. *—Peter Vieira*

MRC (Model Rectifier Corp.), 80 Newfield Ave., Edison, NJ 08818-6312; (732) 225-6360; fax (732) 225-0091; www.modelrec.com.

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HOBBYIST

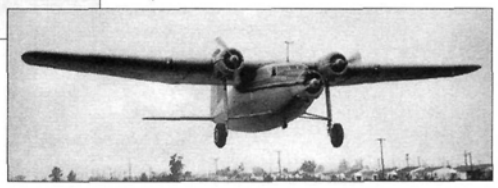
USED ENGINES WANTED: pre-1970 preferred. T. Crouss, 100 Smyrna, West Springfield, MA 01089-1706. [12/00]

NAME THAT PLANE

Can you identify this aircraft?

Send your answer to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Congratulations to Robert Purcell of Sun Lakes, AZ, for correctly identifying our August 2000 mystery plane, the Northrop Pioneer. Designed as a passenger/cargo transport that could take off from airfields that were too small for other contemporary air transports, the Pioneer required a mere 700 feet of runway to take off while carrying five tons of cargo. The 1947 Pioneer's impressive lift and 185mph cruising speed were made possible by an 85-foot wingspan and three, 550hp Pratt & Whitney Wasp engines.



The winner will be chosen four weeks following publication from correct answers received (delivered by U.S. mail) and will receive a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free, one-year extension of his subscription.

Astro Flight News

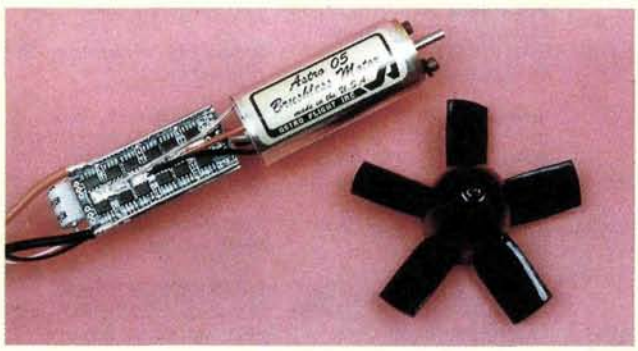
Astro Flight Inc. Introduces five new and exciting products for the electric flyer: The new Mighty Micro 010 Brushless Motor for park flyers, a new Ducted Fan Brushless 05 Motor for the Kyosho T-33, FAI-035 and FAI-05 Planetary Motors for Sailplanes and two new surface mount digital speed controls.

The Mighty Micro is here!

Our new Mighty Micro Brushless 010 Motor #801 has arrived. The motor is one inch in diameter and one inch long and weighs only 35 grams with sensorless control. It spins an APC 6x2.8 prop at 9800 RPM while drawing only 2.5 amps from a six cell 350 mahr Nicad pack. Now you can fly for 5 minutes on Nicads, 10 minutes on Hydrides and one hour on lithium cells. The tiny On-Off Brushless control has Brakes and BEC. This system will work with 5 to 8 cell batteries. Perfect for models up to 10 oz.

New Ducted Fan 05 Motor!

Our new 4 turn Brushless 05 Ducted Fan Motor #805F with 12 FET controller is specially designed to add Afterburner performance to the Kyosho T-33 and WE-Mo-Tek 480 ducted fan units. Run the T-33 fan on 8 or 9 Nicads or 10 Sanyo 3000 mahr Hydrides. The motor draws only 19 amps for 10 minute flights on Hydrides.

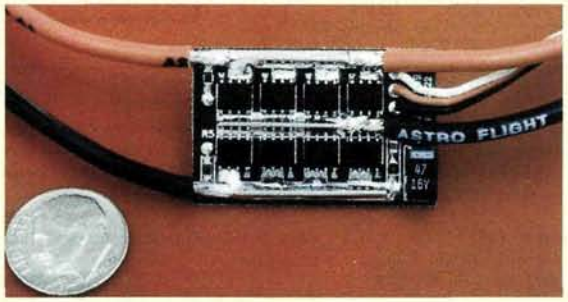


FAI-035 with Planetary Gearbox

Our new 4.4:1 planetary gear box is now available for all Astro Cobalt 035, 05 and 15 motors. The FAI-035 with planetary gear box is perfect for 7 cell competition sailplanes. The FAI-05 with planetary gear box, shown here, is perfect for 10 cell sailplanes.

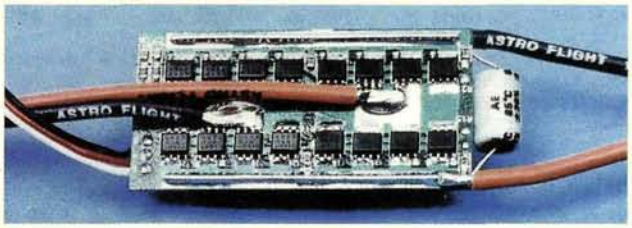
New Astro 215D Airplane Control

The new Astro 215D Speed control uses new surface mount technology for minimum size and maximum performance. The tiny 215D weighs only 8 grams and has Brakes and BEC. It handles up to 30 amps and 10 cells. Perfect for Astro Cobalt 035, 05 and 15 motors.



New 208D Reversing Control

The new 208D Reversing Control is designed for scale boats. It's 16 FET H-Bridge circuit gives you full power forward and reverse. The 208D weighs 1 oz and can handle 25 amps at 6 to 12 volts. It has a 2 amp BEC and a electronic current limit of 28 amps, so no fuses are needed. It was designed for tug boats and works great with 150 pound robots and electric powered blimps.



Astro Flight Inc. 13311 Beach Ave. Marina Del Rey, CA 90292
Phone (310) 821-6242 Fax (310) 822-6637 Web Site http://www.astroflight.com

Featured Manufacturers *The following manufacturers' products are featured in this issue.*

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Airtronics, 1185 Stanford Ct., Anaheim, CA 92805; (714) 978-1895; fax (714) 978-1540; www.airtronics.net.

APC Props; distributed by Landing Products, 1222 Harter Ave., Woodland, CA 95776; (530) 661-0399; fax (530) 666-6661.

Arcamax, 150 E. Pleasant Hill Rd., Ste. 174, Carbondale, IL 62901; (618) 453-4428; www.heli-world.com.

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Balsa Products Engineering, 122 Jansen Ave., Iselin, NJ 08830-2601; (732) 634-6131; www.balsapr.com.

Brison Aircraft, 12075 Denton Dr., Ste. 11, Dallas, TX 75234; (972) 241-9152; fax (972) 241-5065.

Castle Creations, 18773 W. 117 St., E. Drury Ln., Olathe, KS 66061; (913) 438-6325; fax (913) 438-1394; www.castlerc.com.

Century Helicopter Products, 521 Sinclair Frontage Rd., Milpitas, CA 95035; (408) 942-9525; fax (408) 942-9524.

CSM; distributed by Horizon Hobby Dist.

Dave Brown Products, 4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576; fax (513) 738-0152; wwwdbproducts.com.

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FMA Direct, 9607 Dr. Perry Rd., Unit 109, Ijamsville, MD 21754; (800) 343-2934; fax (301) 831-8987; www.fmadirect.com.

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Sullivan Products, One North Haven St., Baltimore, MD 21224; (410) 732-3500; fax (410) 327-7443; www.sullivanproducts.com.

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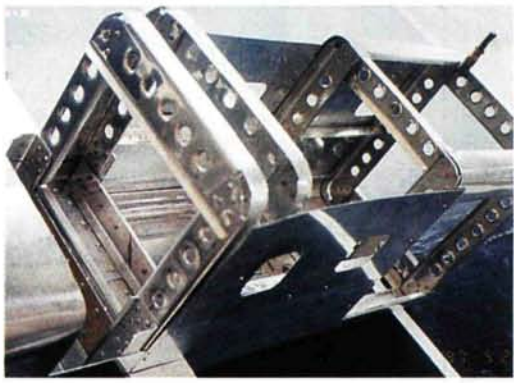
Building all-aluminum RC planes

Many full-size aircraft—P-51 Mustangs, Cessna 180s and Douglas DC-3s, to name a few—are completely constructed of aluminum and steel. Why not build RC models that are totally true to their full-scale subjects?

You might think that an all-metal RC model would be too heavy, would be difficult to build and would invite radio interference, but I have had great success in building and flying many all-metal RC airplanes. An all-aluminum scale model certainly draws a lot of attention at the flying field!

The Pilatus Porter makes its first flight in Carlos Rangel's homeland of Colombia, South America.

Metal models are not heavier than your average fiberglass or wood ones; in fact, when properly designed and built, they can be even lighter. To build a metal model, you use full-size airplane construction techniques, materials and tooling. Building all-metal scale airplanes is odorless, environmentally clean and fun! I usually obtain the full-size aircraft structural manuals and, in some cases, the blueprints, so I can produce my own plans and select the proper materials. I use the highly reliable PCM radio units and have not experienced any radio glitches.



The fuselage structure for a Dornier Do 28 Skyservant twin.

I start by building the basic structures, such as fuselage bulkheads, longerons, wing ribs, wing spars, engine mounts and gear mounts. For the structure, I use between 0.016- and 0.032-inch-thick aviation aluminum. As they do with full-size planes, I drill and flare lightening holes to keep the weight down. As the basic aircraft structure is completed and carefully rigged, skin panels are riveted into place according to their full-size counterparts. It is important that the radio-gear installation, landing-gear attachments and wing joints are finished before you rivet the skins onto the structure.

The basic wing structure. Note the flared lightening holes in the ribs and spars.

Real riveting job on Pilatus Porter. Notice the aluminum internal structure—light and strong!

The Dornier Do 28 nears completion. The model was riveted together just like the full-size plane.

You will need tools such as tin snippers, assorted drills, files, hole-cutters and rulers. Access to a sheet-metal shop is very helpful; I use the shop at the local hangar. Your model can be as complex or as simple as you want it to be, but it is important to understand basic sheet-metal-working skills. At first, you might find that working with metal is difficult or frustrating but, as with anything else, good advice and practice will enable you to do it.

If you're looking for a "different" scale project, I hope you'll consider building a true-to-scale, all-aluminum RC airplane. I guarantee it will be a fun and challenging experience. ✈